EFFECTIVENESS OF NON PNEUMATIC ANTISHOCK GARMENT IN MANAGING CASES OF SEVERE POSTPARTUM HEMORRHAGE IN IOG

Dissertation submitted in partial fulfilment of requirements for

M.D. DEGREE BRANCH II

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MADRAS MEDICAL COLLEGE
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CHENNAI

APRIL 2013

CERTIFICATE

This is to certify that the dissertation entitled "**EFFECTIVENESS OF NON PNEUMATIC ANTISHOCK GARMENT IN MANAGING CASES OF SEVERE POSTPARTUM HEMORRHAGE"** is a bonafide work done by **Dr.B.KARTHIHA** in the Institute of Obstetrics and Gynaecology(Madras Medical College) Egmore, Chennai in partial fulfilment of the university rules and regulations for award of MD degree in Obstetrics and Gynaecology under my guidance and supervision during the academic year2010-2013.

Prof.DR.V.KANAGASABAIM.D
DEAN
Madras Medical College&
Rajiv Gandhi Govt. General Hospital
Chennai–3

Prof.DR.P.MEENALOCHANI
M.D., DGO.
Director and Superintendent
Institute of Obstetrics &Gynaecology
Madras medical college,Chennai-3

Prof. DR.S.USHARANIM.D., DGO.
Guide,
Institute of Obstetrics and Gynaecology
Madras medical college,Chennai-3.

DECLARATION

I solemnly declare that this dissertation entitled **"EFFECTIVENESS OF NON PNEUMATIC ANTISHOCK GARMENT IN MANAGING CASES OF SEVERE POSTPARTUM HEMORRHAGE"** was done by me at the Institute of Obsterics & Gynaecology, Madras Medical College during 2010-2013 under the guidance and supervision of, **Prof.Dr.S.USHARANI MD.,DGO.** This dissertation is submitted to the TamilNadu Dr.M.G.R. Medical University towards the partial fulfilment of requirements for the award of M.D. Degree in Obstetrics and Gynaecology (Branch-II).

Place:Chennai-3

Date:

Signature of Candidate

Dr.B.KARTHIHA.,M.B.B.S
MD Post Graduate Student
Institute of Obstetrics &Gynaecology
Egmore, Chennai

Prof. DR.S.USHARANI.,M.D., DGO.
Guide,
Institute of Obstetrics and Gynaecology
Madras medical college,Chennai-3.

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI -3

Telephone No : 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr. B. Karthiha
PG in MD Obstetrics & Gynaecology
Madras Medical College, Chennai -3

Dear Dr. B. Karthiha

The Institutional Ethics committee of Madras Medical College, reviewed and discussed your application for approval of the proposal entitled " Effectiveness of antishock garment in managing cases of severe postpartum hemorrhage" No.01062012.

The following members of Ethics Committee were present in the meeting held on 19.06.2012 conducted at Madras Medical College, Chennai -3.

1.	Dr. S.K. Rajan. M.D.,FRCP.,DSc	-- Chairperson
2.	Prof. K. Ramadevi MD Prof of Biochemistry, MMC, Ch-3	-- Member
3.	Prof. R. Nandhini MD Director, Inst. of Pharmacology ,MMC, Ch-3	-- Member
4.	Prof. C. Rajendiran, MD Director , Inst. of Internal Medicine, MMC, Ch-3	-- Member
5.	Prof. S. Deivanayagam MS Prof of Surgery, MMC, Ch-3	-- Member
6.	Prof. A. Radhakrishnan MD Prof of Internal Medicine, MMC, Ch-3	-- Member

We approve the proposal to be conducted in its presented form.

Sd/ Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.

Member Secretary, Ethics Committee

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CONTENTS

INTRODUCTION

Obstetric hemorrhage is the leading cause of maternal mortality in developing countries.Active management of third stage of labour(AMTSL) and measures such as oxytocin can be used to manage cases of uterine atony.Inspite of all these measures there are women who continue to bleed. The international federation of Gynecology& Obstetrics (FIGO) and the international confederation of midwives (ICM) advised exploring the potential of anti shock garment to reduce mortality associated with obstetric hemorrhage.

The NASG is a device of recent technology and is made of neoprene and Velcro fastening tape. It consists of nine segments and it also shunts blood from the lower limbs to the vital organs and decreases the intramural pressure of the vessels of uterus, abdomen and lower limb and also reduces the radius of these vessels thereby decreasing the blood flow. It is a boon to the women who need to be transported a long distance to reach centres which can give appropriate care and she can safely remain in NASG for longer duration of time without any adverse effects.

REVIEW OF LITERATURE

STUDIES ON NASG

STUDIES CONDUCTED IN PAKISTAN

The beneficial effects of using the NASG in low resource areas was analysed in a study conducted in Silkot, which is in Pakistan.[1,2]. This was based on 150 cases in one hospital. The hospital did not have any blood bank facilities and in emergency blood has to be obtained from the donors directly. The persons who conducted the research[3] documented that NASG placed patients were rapidly resuscitated from the effects of hypovolemic shock and they were stable for longer period of time. There seems to be no adverse effects in keeping patients for longer duration in NASG. The patients' vitals were stable during the entire time duration and none had any serious adverse effects however long the duration of application may be.

NASG study series in Egypt

The study was conducted in teaching facilities of EGYPT.(El Galaa, Alexandria, Assiut, and Al Minya).

The study group was divided into two groups which included the Pre intervention group and the Post intervention group.

The patients in the Pre intervention group was not applied non pneumatic antishock garment and had 150 patients in that group. The patients in the post

intervention group was applied NASG and was started with 150 patients in each group. This was needed to show a 50% difference in blood loss between them and the final study was conducted with 156 patients in the preintervention group and 204 patients in the post intervention group. The diagnosis of obstetric haemorrhage covered a wide range of diagnosis and there were no significant difference between the two groups. The diagnosis included were:

- Uterine atony
- Genital tract lacerations
- Abortion and itscomplications

The patients included in the post intervention group were initially in a clinically bad condition with more signs of shock and had greater blood loss than those included in the preintervention group with an estimated blood loss of about 1000ml.

In the same way women in the NASG group had lower blood pressure than the pre-intervention group. The researchers would have probably waited for the women in the post intervention group to become worse clinically since they were not used to apply NASG.

The women in the post intervention group-(NASG) group has less blood loss than those women in the pre intervention group. The difference in blood loss was statistically significant with a p value of < 0.001. The other adverse

outcomes like acute morbidities[4] and the mortality rates were also less in the post intervention or the NASG group but it was not statistically significant. The women who were in a clinically bad shape in the NASG group had more number of surgeries than those in the pre-intervention group as expected. The patients in the two groups received the same resuscitation protocol. The decrease in the other adverse effects were reassuring but will require studies using larger samples to obtain good results.

Studies conducted in Nigeria and Mexico

Studies are being conducted in four urban hospitals in Nigeria and Primary Health Centres in Mexico where they are referred to as UMRs (Unidades Medicales Rurales). It will take longer time to transport the women from PHCs to those centres with comprehensive emergency obstetric care (CEOC) facilities.

An example for the effectiveness of NASG from a case report in Mexico:

A 25 year old women with an obstetric score of Gravida 2, Para 1 had a home delivery which was attended by the TBA(Traditional Birth Attendant). The TBA was educated about the use of NASG by the community outreach group. The women had retained placenta and started bleeding profusely. The TBA arranged for transport to a UMR. During that travel, the patient suffered around 2000ml of blood loss and had a pulse rate of 160 when she reached an UMR 2 hours later. There she was applied NASG and from there she was

transported to another CEOC centre. During that travel the patient had 300ml blood loss which was much less than the previous one. In the CEOC centre, she was resuscitated and manual removal of placenta was done and given blood transfusion. She became well and was discharged home in a good condition.

In Nigeria, the studies are conducted in Urban CEOC hospitals. There the patients were divided into two groups. The Pre intervention group who were not applied NASG and the Post intervention group who were applied NASG. The patients in the post intervention group were initially in a clinically bad condition with more signs of shock and had greater blood loss than those in the pre-intervention group with an estimated blood loss of about 1000ml.

In the same way women in the NASG group had lower blood pressure than the pre intervention group. The women in the post intervention group-NASG group has less blood loss than those women in the pre intervention group. The difference in blood loss was statistically significant with a p value of < 0.001.

An analysis of 33 cases from Nigeria was made. These patients had severe postpartum haemorrhage. They were in a clinically bad condition with altered mental status. During resuscitation, the following vitals were measured every 15 minutes:

- Pulse rate

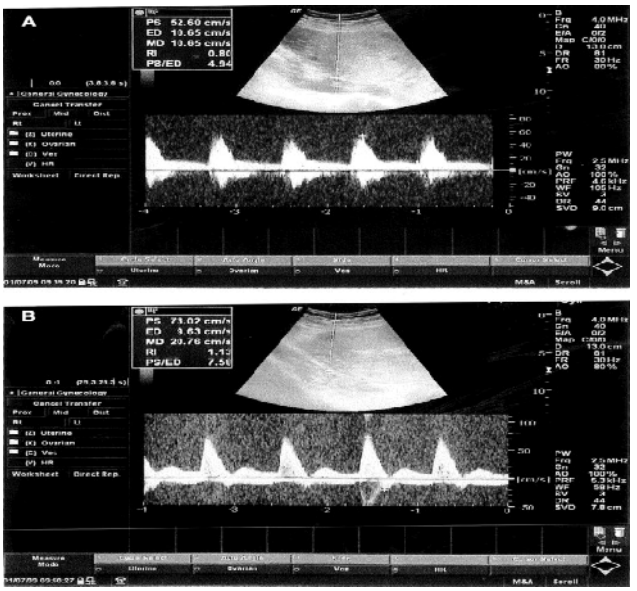
- Blood pressure
- Urine output

These patients were given 1500ml of saline rapidly and additional fluids were given so as to achieve a blood pressure of 80/50mmhg or mean arterial pressure of 60mmhg.The study results are as follows:

Among the 33 patients, 32 survived and 1 expired. Among those who survived, the patients had remarkable improvement in vitals within the first 15 minutes of NASG application and women who were given fluids rapidly had earlier recovery than those who did not receive the fluids rapidly.

NASG AND ITS EFFECTS ON PELVIC BLOOD FLOW

Lester et al[(7)]conducted a study so as to analyse the effects of NASG on pelvic blood flow as a physiological mechanism in post partum women. 10 women were included in the study and they had no haemorrhage.



This figure shows the RI of internal iliac artery before and after application of NASG which shows that there is a increase in the RI after NASG application.

The Resistive Index (RI) of the internal iliac artery was measured using a non invasive technique of Doppler ultrasound. The study was done before and after the application of NASG. The NASG application significantly raised the Resistive Index of internal iliac artery and reduced the pelvic blood flow.

PHYSIOLOGY OF THIRD STAGE OF LABOUR

"If you can fill the unforgiving minute with sixty seconds worth of distance, run" –kipling

This is indeed the unforgiving stage of labour, and in it lies more unheralded treachery than in both the other stages of labour combined. The normal case can, within a minute become abnormal and successful delivery, can swiftly turn into disaster. The obstetricians judgement must be sure and swift and errors of commission carry with them penalties as great, or greater than those of commission. Increasing experiences serves only to sharpen one's alertness during this stage and these is no room for complacency in any case, however normal, until the placenta has been delivered for at least half an hour, with the uterus well retracted and with minimal bleeding.

It is important to understand the sequence of events in the third stage of labour and basic mechanism of placental separation so that it will help us detecting the complications of third stage and to manage effectively this complications.

ROLE OF HORMONES

Prostaglandin F(PGF), PGF_2 ALPHA and oxytocin are the biochemical agents primarily involved in the 3^{rd} stage of labor. During the first and second stage of labour, only PGF_2 ALPHA and oxytocin are significantly raised in maternal plasma compared to prelabor concentrations. At 5 minutes after birth, maternal PGF and PGF_2 ALPHA concentration peak at about twice the levels found at the commencement of the second stage. A rapid increase in prostaglandin concentrations is also found in umbilical cord venous blood, suggesting that this postpartum prostaglandin surge originates in the placenta[(8)].

After placental separation the concentrations decrease but at rates slower than the metabolic clearance of prostaglandin, indicating that its production continues in the decidua andmyometrium. Plasma oxytocin also drops to prelabour levels in 30 minutes of deliveryunless sustained by exogenous infusion.

PHASES OF PLACENTAL SEPARATION

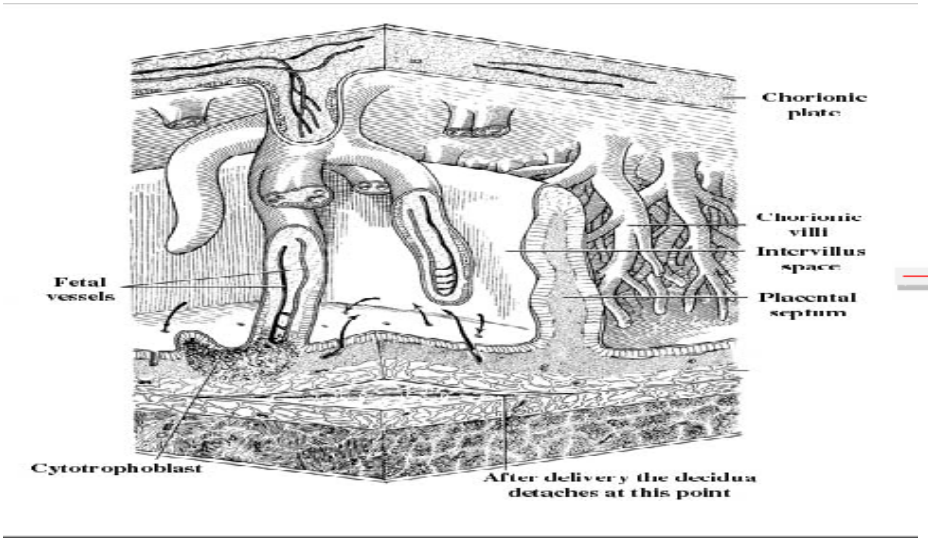
Continuous real time ultrasound, performed during the third stage of labour, has shown that the process of placental separation can be divided into four phases[9].

1. Latent phase- Uterine wall at the placental site remains thin;placenta-free wall contracts
2. Contraction phase - Thickening of uterine wall at the placental site.
3. Detachment phase- Actual separation of the placenta from the adjacent uterine wall.
4. Expulsion- Sliding of placenta out of the uterine cavity.

Forceful uterine contractions in the latent phase induce shearing forces between the uterine wall and the unyielding placental tissue, initiating the separation of the placenta. A wave of separation begins at one of the placental poles usually at a point near to the lower segment, and propagates towards the fundus during the contraction &detachment phases.

SITE OF PLACENTAL SEPARATION

The plane of separation runs through deep spongy layer of deciduabasalis so that a variable thickness of decidua covers the maternal surface of separated placenta.



MECHANISM OF PLACENTAL SEPARATION

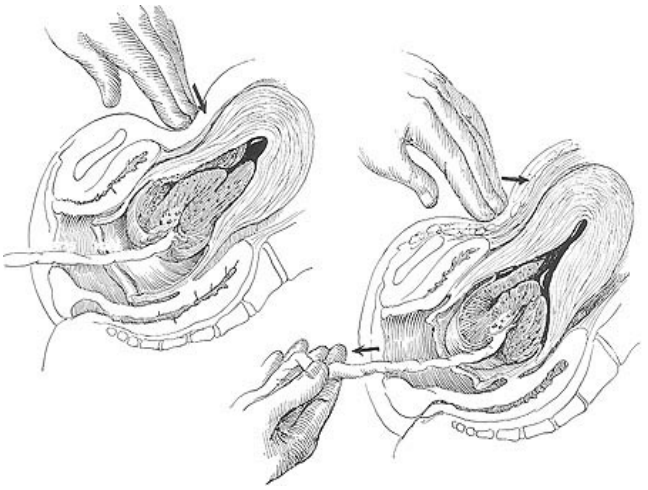
Separation of the fundal placenta begins at more than one of the placental poles, and the central part is last to separate. This is the reverse of Schultze and Mathew Duncan mechanism. In almost half of the cases, with a previous caesarean section the separation pattern was reversed, commencing at the fundus, suggesting that myometrial strength in the region of the uterine scar may have been compromised[(10)].

OTHER PROPOSED MECHANISM

1-Schultze-Central Separation:

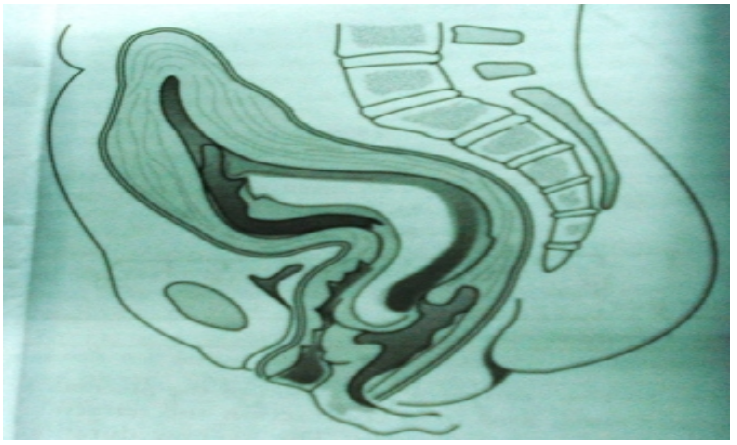
Detachment of placenta from its uterine attachment starts at the centre resulting in opening up of few uterine sinuses and accumulation of blood behind the placenta (retroplacental hematoma). With increasing contraction, more and

more detachment occurs facilitated by weight of the placenta and retroplacental blood until whole of the placenta gets detached.



2-Marginal separation (Mathews-Duncan)

Separations starts at the margins as it is mostly unsupported with progressive uterine contraction, more and more areas of the placenta get separated. Marginal separation is found more frequently.



SEPARATION OF THE MEMBRANES

The membranes which are attached loosely in the active part are thrown into multiple folds. Those attached to the lower segment have already separated during its stretching. The separation is facilitated partly by uterine contraction and mostly by weight of the placenta as it descends down from the active part. The membranes so separated carry with them remnants of the decidua vera giving the outer surface of the chorion its characteristic roughness[(11)].

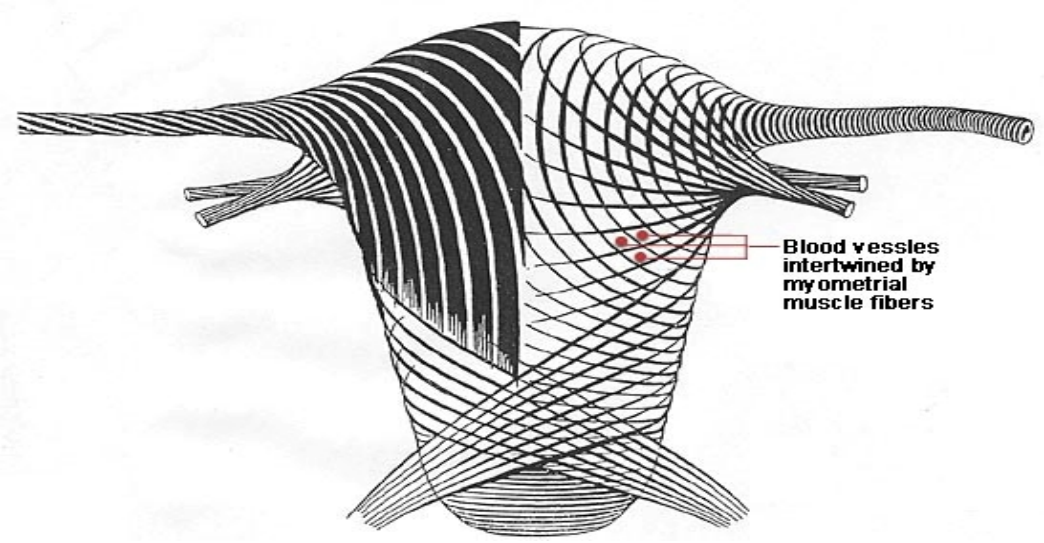
Expulsion of the placenta

After complete separation of the placenta, it is forced down into the flabby lower uterine segment or upper part of vagina by effective contraction & retraction of the uterus. Thereafter , it is expelled out by either voluntary contraction of abdominal muscles (bearing down efforts) or by manipulative procedures.

Mechanism of control of bleeding

After the placental separation, innumerable torn sinuses which have free circulation of blood from uterine and ovarian vessels have to be obliterated. The occlusion is effected by complete retraction where by the arterioles, as they pass tortuously through the interlacing intermediate layer of the myometrium, are literally clamped. It is the principal mechanism to prevent bleeding. However thrombosis occurs to occlude the torn sinuses, a phenomenon which is

facilitated by hypercoagulable state of pregnancy. Apposition of the walls of the uterus following expulsion of the placenta (uterine myotamponade) also contributes to minimize blood loss and so the uterine muscles are called as "LIVING LIGATURES".



Duration of the third stage:

Although spontaneous delivery of the placenta usually occurs within 10 minutes of the baby's birth, the third stage is not considered prolonged unless it lasts more than 30 minutes.

Combs & laros,[(12)] in a 11 year study of 12,979 consecutive singleton vaginal deliveries, demonstrated that the duration of 3rd stage followed a lognormal distribution with a median of 6 minutes (interquartile range, 4 to 10 minutes). The prevalence of 3rd stage in excess of 30 minutes was 3.3%.

Management options

Active management of the Third stage includes:

- Administration of a prophylactic oxytocic agent or prostaglandin immediately after baby's birth to induce uterine contraction .
- Immediate clamping & cutting of the cord to enhance placental separation
- Placental delivery by controlled cord traction

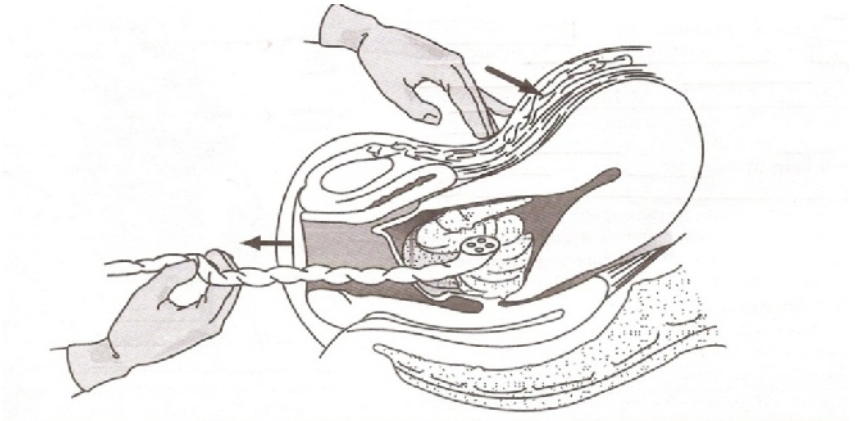


Fig. 13.6 Brandt–Andrews maneuver: Delivery of placenta

FIGO-ICM definition includes:

Fundal massage should be given after delivery of the placenta, and the uterus should be palpated every 15 minutes and it does not advice immediate cord clamping.

<u>Expectant management</u>

- No prophylactic oxytocic
- No cord clamping until pulsations cease

- Delivery of the placenta is by maternal effort & gravity rather than cord traction.

Trials

Bristol trial[13], where active management has been the norm and the Hinching Brooke[14] trial where expectant management had been the norm, both demonstrated significant reduction in the incidence of PPH by active management of labour (5.9% vs 17.9% & 6.8% vs 16.5% respectively).

Timing of cord clamping

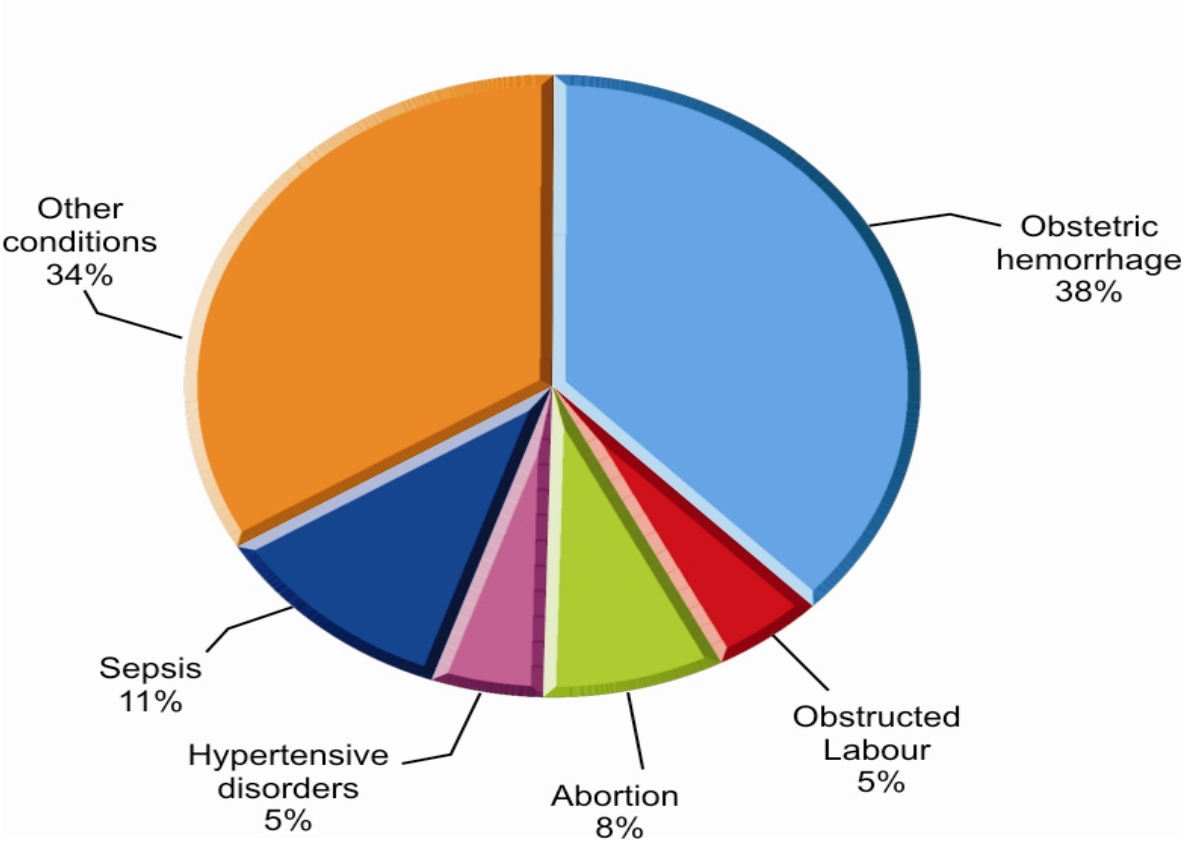
The WHO review of evidence on management of the third stage concludes,

"There is no clear evidence to favour one practice over the other. Delaying and clamping until the pulsations stop is the physiological way of treating the cord & is not associated with adverse effects, at least in normal deliveries. Early cord clamping conflicts with traditional beliefs & is an intervention that needs justification".

POSTPARTUM HAEMORRHAGE

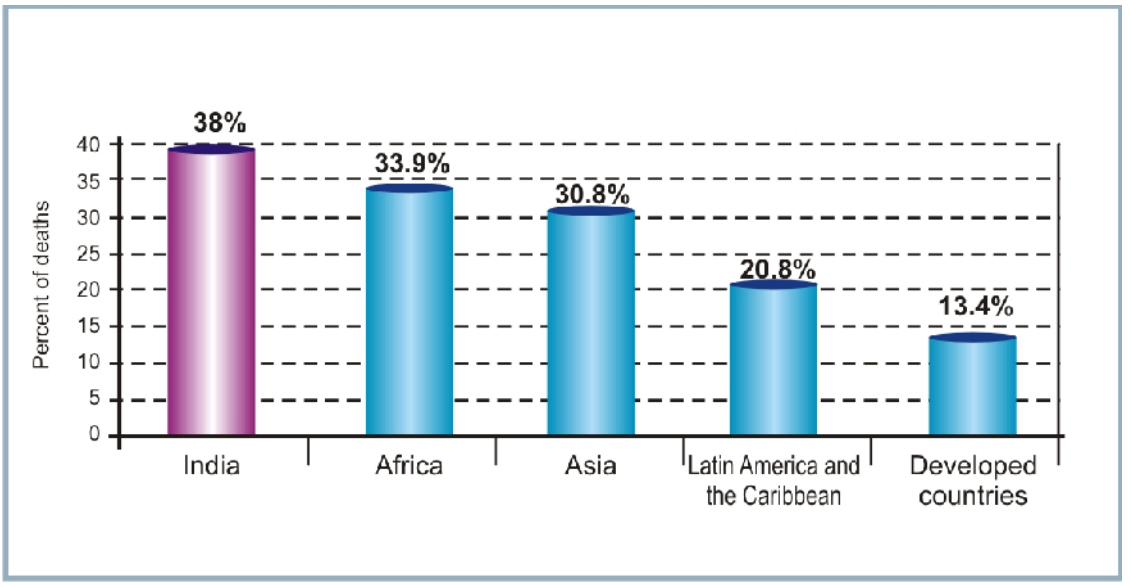
Definition

Any amount of bleeding from or into the genital tract following birth of the baby upto the end of the puerperium which adversely affects the general condition of the patient evidenced by rise in pulse rate and falling blood pressure is called Postpartum Hemorrhage.



Source: Sample Registration System, Registrar General of India, 2003

Percentage of maternal death due to obstetric hemorrhage by region.



Source: Khan KS, Wojdyla D, Say L, et al. WHO analysis of causes of maternal death: a systematic review. Lancet 2006; 367: 1066-74

TYPES

Primary:

Hemorrhage occurs within 24hrs following the birth of the baby. In the majority, hemorrhage occurs in 2hrs following delivery.

Thirdstage hemorrhage: Bleeding occurs before expulsion of placenta

True postpartum hemorrhage – Bleeding occurs after the expulsion of the placenta.

Secondary:

Hemorrhage occurs after 24 hrs and within six weeks of delivery, also called delayed hemorrhage.

CAUSES:

- Atonic (80%)
- Traumatic
- Mixed
- Blood coagulopalthy

	Aetiology process	**Clinical factors**
Abnormalities of uterine contraction(Tone)	- overdistended uterus	-polyhydramnios -multiple gestation -macrosomia
	- uterine muscle exhaustion	-rapid labour -prolonged labour -high parity
	- intra-amniotic infection	-fever -prolonged ROM
	-function/anatomic distortion of the uterus	-fibroid uterus -placenta previa -uterine anomalies

Retained products of conception (Tissue)	-retained products -abnormal placenta -retained cotyledon or succenturiate lobe -retained blood clots	-incomplete placenta at delivery -previous uterine surgery -high parity -abnormal placenta on U/S -atonic uterus
Genital treat trauma (Trauma)	-lacerations of the cervix,vagina or perineum -extension, lacerations at caesarean section -uterine rupture -uterine inversion	-precipitous delivery -operative delivery -malposition -deep engagement -previous uterine surgery -high parity -fundal placenta
Abnormalities of coagulation (Thrombin)	-pre-existing stage -hemophilia A -von Willebrand's disease	-h/o hereditary coagulopathies -h/o of liver disease

	-acquired in pregnancy -ITP -thrombocytopenia with pre-eclampsia -DIC -pre-eclampsia -dead fetus in utero -severe infection -abruption -amniotic fluid embolus -therapeutic anti-coagulation	-bruising -elevated BP -fetal demise -fever, WBC -antepartum hemorrhage -sudden collapse -h/o of blood clot

SHOCK AND PPH

Definition:

- Circulatory failure leading to inadequate perfusion and delivery of oxygen to vital organs

Pathophysiology of hypovolemic shock

Early stages:-

- there is decrease in MAP, stroke volume , cardiac output and CVP
- catecholamine release causes contraction of capacitance vessels and cause redistribution of blood flow.
- these are accompanied by increase in heart rate, systemic vascular resistance and also in pulmonary vessels and the myocardial contractility increases thereby increasing the blood flow to the vital organs.

Late stage:

- If the blood loss exceeds 25% the compensatory mechanisms are inadequate
- Maldistribution of blood flow results in local tissue hypoxia and metabolic acidosis producing a vicious cycle of vasoconstriction, organischemia and cellular death.

- Haemorrhage activates lymphocytes cause endothelial activation.
- Platelet microaggregation causes vascular occlusion
- Electrolyte imbalance

Clinical indicators of hypovolemic shock:

- reduced MAP
- tachycardia
- tachypnea
- cool skin and extremities
- acute altered mental status
- oliguria
- shock index- heart rate / systolic blood pressure and the normal value is 0.5 to 0.7

ASSESSMENT OF STAGES OF HYPOVOLEMIC SHOCK

% Blood Volume loss	< 15%	15 – 30%	30 – 40%	>40%
HR	<100	>100	>120	>140
SBP	N	N, dec DBP,	decrease	decreased

		postural drop	d	
Pulse Pressure	N or increased	decreased	decreased	decreased
Cap Refill	< 3 sec	> 3 sec	>3 sec or absent	absent
Resp	14 – 20	20 – 30	30 - 40	>35
CNS	Anxious	v. anxious	confused	lethargic
Treatment	1 – 2 L crystalloid, + maintenance	2 L crystalloid, re-evaluate	2 L crystalloid, re-evaluate, replace blood loss 1:3 crystalloid, 1:1 colloid or blood products. Urine output >0.5 mL/kg/hr	

Measures for MINOR PPH[15]

This includes blood loss of 500 to 1000ml with no clinical signs of shock.

- Intravenous access using a wide bore needle.
- start crystalloid infusion.

MAJOR PPHPROTOCOL[15]:

This includes blood loss of more than 1000 ml, continuing to bleed or those with clinical signs of shock.

- Airway assessment
- Breathing assessment
- Evaluate circulation
- Administer oxygen by mask
- Intravenous access using two wide bore cannulas
- Flat position
- Warming the patient using appropriate measures
- Blood transfusion as soon as possible
- Infuse rapidly upto 3.5 litres of crystalloids as rapidly as possible till blood is available

- The best to administer is RAPID and WARMED FLUIDS
- Do not use special filters as they slow the infusion
- Use of recombinant factor VII can be decided as per the need

Fluid therapy and transfusion of blood products

- Crystalloidsof about 3.5 litres
- Keep the blood ready – if the appropriate blood is not available give Rh negative Ó blood.

Fresh frozen plasma: 4 units for every 6 units of red cells

Platelets transfusion: if Platelet countless than 50,000

Cryoprecipitate: If fibrinogen < 1 g/l

OBSTETRIC MANAGEMENT

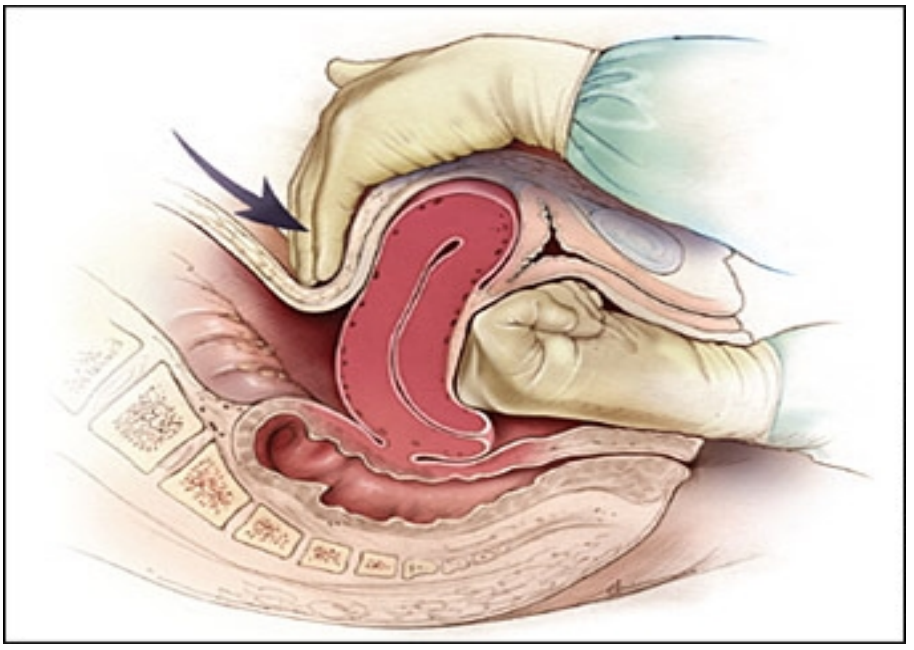
When there is uterine atony, the following needs to be done:

- Bimanual uterine compression
- Catheterise the bladder
- Syntocinon 5units can be given as IV bolus
- Administer methylergometrine 0.5mg by IV or IM injection
- Start oxytocin infusion

- Carboprost 0.25 mg by intramuscular injection. It can be repeated every 15 min to a maximum of eight doses. It is contraindicated in asthmatics.

- Carboprost can be given by direct intramyometrial injection

- Misoprostol 1000 micrograms per rectally.



SURGICAL MEASURES

- Intrauterine balloon tamponade is an appropriate firstline‘surgical’ intervention
- hemostatic brace suturing (such as using procedures described by B-Lynch or modifiedcompression sutures)
- bilateral ligation of uterine arteries

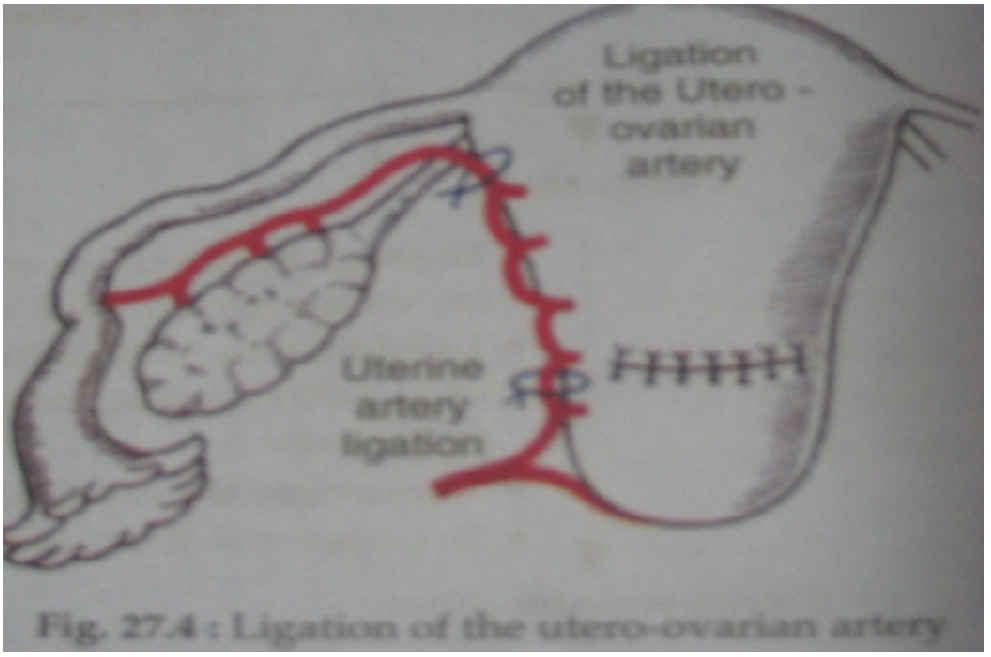


Fig. 27.4 : Ligation of the utero-ovarian artery

- bilateral ligation of internal iliac (hypogastric) arteries
- selective arterial embolisation.
- Resort to hysterectomy sooner rather than later

A second consultant clinician should be involved in the decision for hysterectomy[15].

MASSIVE BLOOD TRANSFUSION

Definition:

Defined as "Transfusion of more than 10 units of Packed Red Blood Cells in a 24 hour period"[25].

It is also defined as, "Replacement of patient's blood volume with packed RBCs in 24 hours or transfusion of more than 10 units of blood over a period of few hours"[26].

COMPLICATIONS OF BLOOD TRANSFUSION

STORAGE CHANGES:

- Hyperkalemia
- Decrease in 2,3- DPG
- Degeneration of functional granulocyte and platelets
- Decrease in clotting factors
- Decrease in PH
- Decrease in RBC deformability and viability

TRANSFUSION REACTIONS:

- Acute non haemolytic reaction which includes Hypersensitive and Febrile non haemolytic reactions
- Haemolytic reaction which include Acute immune lysis and Delayed hemolysis
- TRALI –transfusion related acute lung injury

- GVHD- graft versus host disease

COMPLICATIONS OF MASSIVE BLOOD TRANSFUSION:

ALTERATIONS IN COAGULATION SYSTEM:

- Acidosis which interferes with assembly of coagulation factors
- Hypothermia
- Dilution of plasma clotting factors
- Dilutional coagulopathy
- Dilutional thrombocytopenia

COMPLICATIONS OF CITRATE TRANSFUSION:

- Metabolic alkalosis
- Hypocalcemia
- Hypothermia
- Hyperkalemia

VOLUME OVERLOAD:

- This can also occur in massive blood transfusions.

THE NON-PNEUMATIC ANTI-SHOCK GARMENT

INTRODUCTION

The FIGO/ICMhave given recommendations for actively managing thethird-stage labour,which have reduced the incidence of severe postpartum hemorrhage due to atony. Inspite of all these atleast 1% of women suffer from hemorrhage. These women need tobe given multiple blood transfusions and surgical interventions as needed. NASG is a promising technology so as provide first aid care to the patient until the time definitive care is available[1,16].

Endorsements of the NASG

Strong and early endorsements of the NASG have come from both WHO and the International Federation of Gynecology and Obstetrics (FIGO). In March 2012, the WHO Expert Committee on the Prevention and Treatment of PPH included use of the NASG as a "temporizing measure until appropriate care is available" among their 32 recommendations. FIGO Committee for Safe Motherhood and Newborn Health endorsed the use of the NASG for the prevention and treatment of PPH: "The NASG is a true life-saving device for women in shock and close to death due to PPH. This is a major life-saving support device, easy to administer by any health personnel and needs to be available for pregnant women everywhere and particularly in low resource countries."

THE NON-PNEUMATIC ANTI-SHOCKGARMENT

The NASG is a device of low technology for providing first aid care to the patient with obstetric hemorrhage and it acts by applying counter pressure to the lower limbs. It is a very effective tool for transporting women from lower facility centre to CEmOC centres.

THE GARMENT

The NASG is lightweight and is relatively cheap and it can be washed and reused. It can be washed around 50 times. It is made up of neoprene and it is manufactured by a company in US which has received the approval of Food and Drug Administration (FDA).It has received a regulation number from FDA.

PARTS:It consists of

- Three segments for each lower limb
- A segment for pelvis
- A segment for abdomen with a small compression ball made of foam.

Unlike the PASG, NASG has no pumps, tubes or gauges and it uses the three way elasticity of neoprene and tight grip of Velcro fasteners. It can apply pressure upto 30-40mmhg of counter pressure to the lower limbscircumferentially. This can result in autotransfusion of about 500-1500ml

of blood to the vital organs. It can be applied easily by anyone with no medical background.Application causes improvement in sensorium and vital signs and patient canbe stable till appropriate interventions are undertaken.

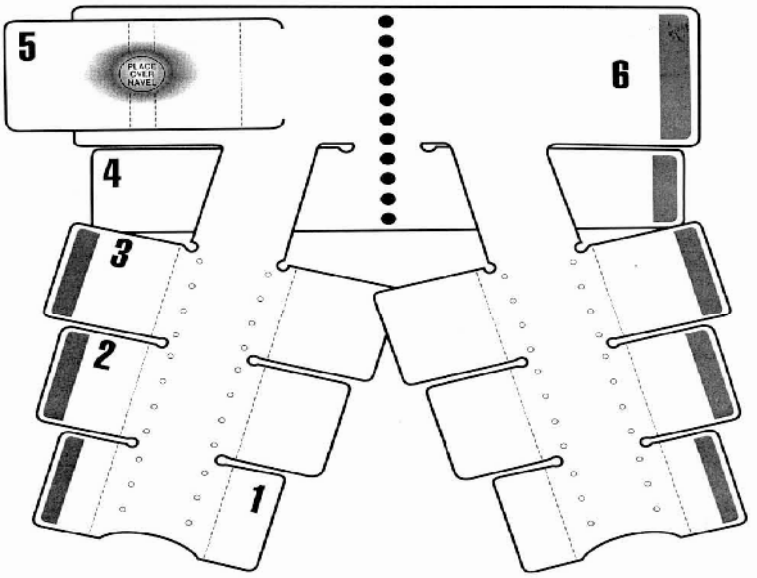


Figure 1 Schematic diagram of the non pneumatic anti shock garment

Figure 2 Patient wearing the non-pneumatic anti-shock garment in hospital

MECHANISMOF ACTION OF ANTISHOCK GARMENTS

Laws of physics underlying the mechanisms of action of anti-shock garments:

Poiseuille's law:

F= (P1-P2) R4/8N *L

F, flow;

P1, entrance pressure; P2, exit pressure; R, radius; N, viscosity; L, lengthFlow rate through a blood vessel is related to the vessel's radius; rate per unit time is relatedto the fourth power of the radius

Laplace's law:

T= P*R

T, tension inside blood vessel; P, transmural pressure; R, vessel radius

External counter-pressure compresses lower body and splanchnic vessels, reduces transmural pressure and vessel radius. These synergistic effects reduce the difference in tension across the vessel, reducing blood loss

Bernoulli's principle:

Q= (A*P + 2V)/E

Q, rate of leakage; A, area of laceration/tear/opening; P, transmural pressure; E, density of blood; V, speed or velocity of blood flow

Rate of leakage from open blood vessels depends on the size of the defect and the intraluminal pressure and the extraluminal pressure (together represented by transmural pressure). External pressure compresses torn vessel walls and reduces the area of the defect.

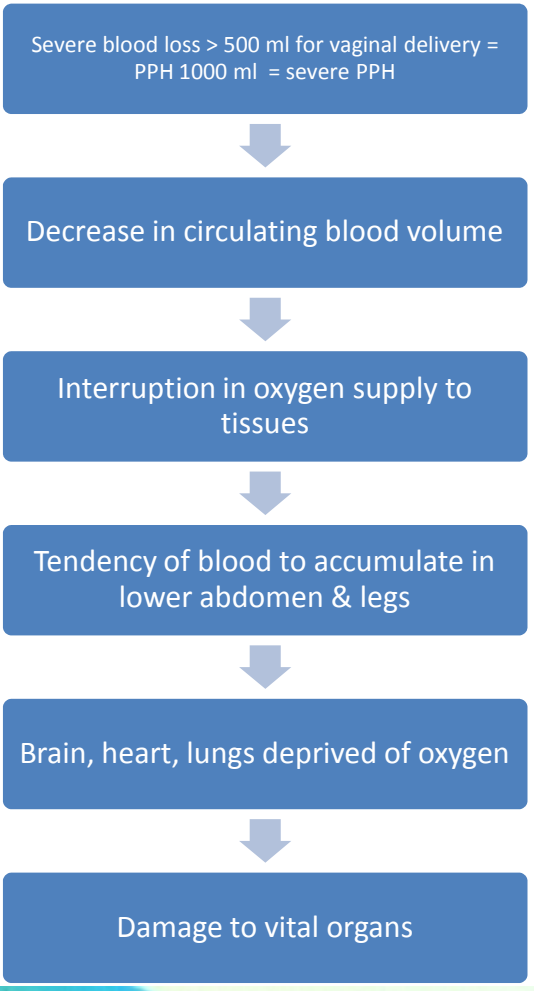
- NASG works by applying counter pressure to lower body and causes increase in blood pressure. This causes decrease in the intravascular volume and increases the vascular resistance in the vessels of the compressed portions.

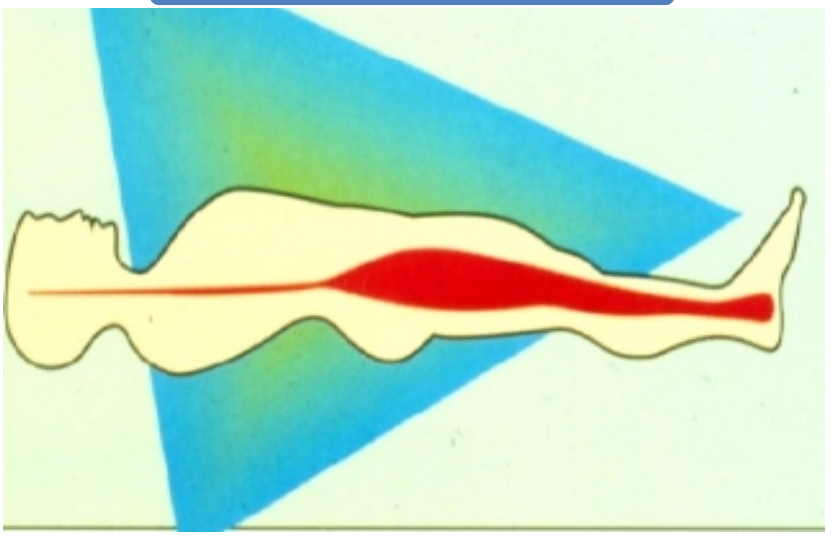
- In the compressed region, the vessel's radius decreases and it in turn slows down the blood flow in that region. There is increased venous return and increased preload which causes increase in cardiac output.

- NASG also causes increase in the resistance index of the internal iliac artery and it decreases the blood flow in the pelvic region.

- All these causes decrease in blood flow in lower limbs and diverts the blood flow to the vital organs.

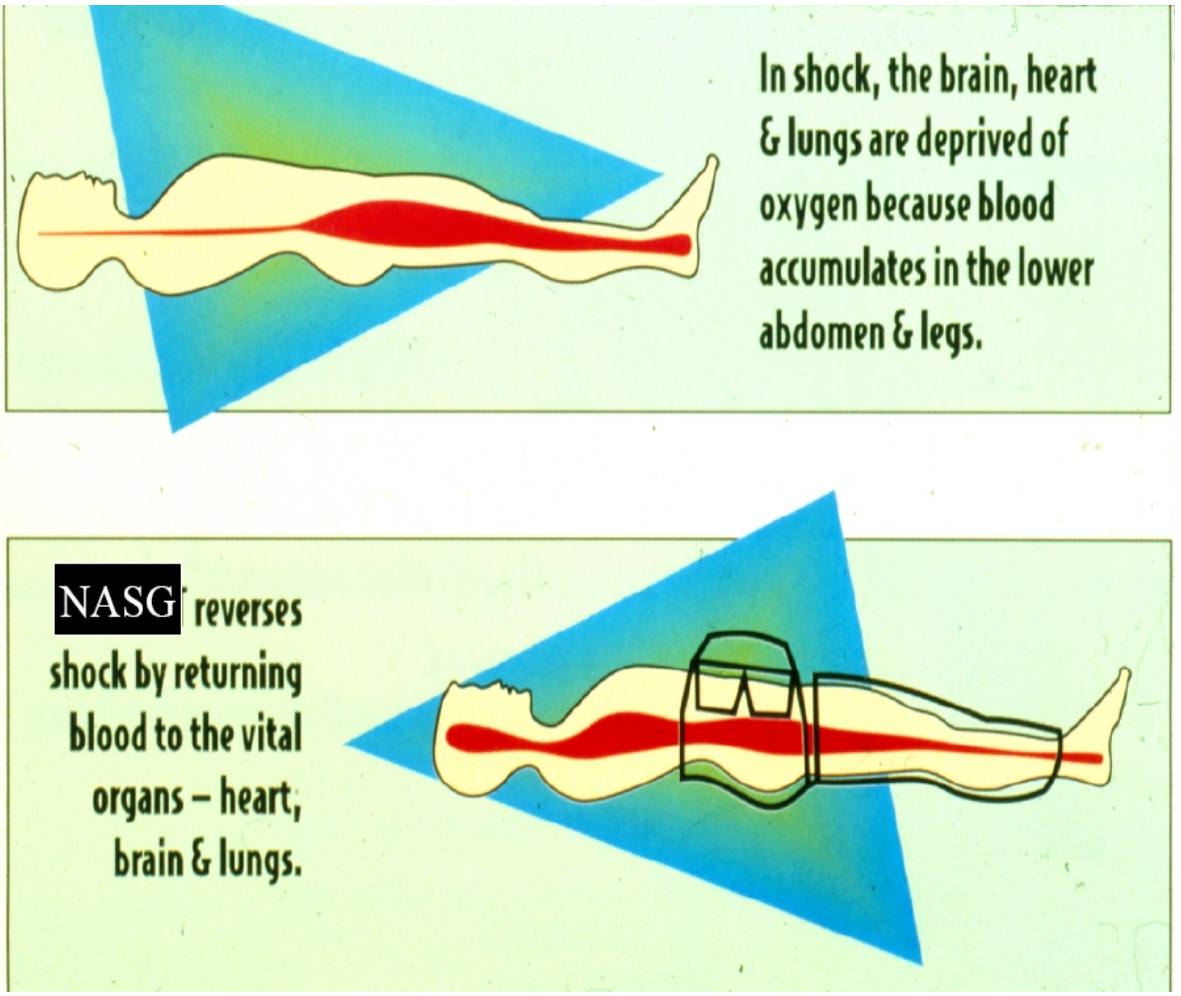
How hemorrhage causes death and morbidity:





This shows how bleeding deprives the oxygen supply to vital organs and place them at a high risk for ischemic damage.

How the NASG works



DEVELOPMENT OF THE GARMENT

The present NASG is a device with less or none reported adverse effects than its fore runner which is the Pneumatic Anti Shock Garment. The first antishock garment which can be inflated and used was deviced by Crile, a surgeon.PASG was modified several times and it was modified for the Army Air corps to MAST – military anti shock trousers. PASG was included for the treatment of intractable hemorrhage by ACOG in 1998[19].

BENEFICIAL EFFECTS OF THE NASGIN LOW-RESOURCE SETTINGS:

The NASG was adapted from the PASG by the National Aeronautics and Space Administration (NASA) in 1971, when the NASA/Ames Research Centerwas trying to developa pressure suit which could be the prototype and it was designed to protect hemophiliac children from bleeding into elbow and knee joints. It acts by compressing and it also straightens the joint till the time treatment was available[20]. Both the Pneumatic and Non-Pneumatic anti shock garments provide counter pressure to the lower limbs circumferentially. NASG is simple and it can be applied quickly and easily. It is cheaper and has little or no adverse effects[21].

The NASG is useful especially in areas of low resources:

- The NASG is of light weight and it can be flexed easilyand can be applied for longer duration. It is very useful for transporting patients. It causes improvement in sensorium and vital signs within minutes of application.
- Women can remain in the NASG till their circulatory status is stabilised[22].
- NASG applies pressure of about 30-40mmhg as compared to PASG which applies pressure of 100mmhg.Hence adverse effects like Anterior Compartment Syndrome are not reported with NASG
- NASG permits complete perineal access to repair genital lacerations andexaminations like speculum or bimanual examination can be performed easily and procedures like manual removal of placenta,MVA and curettage can be done with the NASG in place.
- NASG causes significant reduction in blood loss. On application of the NASG the following happens:
- It causes the external counter pressure which was applied circumferentially to be distributed evenly to the abdominal cavity and

the surrounding of circulatory vessels- ACTS AS A TAMPONADE TO VENOUS BLEED

- NASG reduces the radius of the arteries and causes reduction in transmural pressure and this causes decrease in the tension in the arterial wall. This causes closure of the defect and decrease in blood loss.
- The pressure of only 30-40mmhg can stop arterial bleeding when applied externally.
- NASG can be applied by persons with no medical background with minimal training. The patient can be safely transported with the garment in place. Thus it is a boon in low resource centres for transporting patients to higher centres.

NASG Vs PASG:

	PASG	**NASG**
Persons Required	Atleast2 persons who are authorised.	1 Person with no medical background
Complexity	High	Low,easy to apply
Training necessary	Depending on regional protocols,> 10 hrs,	<1 hr and basic trainingwith practice

	regular practice	
Management during transport	Complex	Simple
Cost	High	Low
Adverse effects	Compartment syndrome	None known
Other serious risks	Pump failure can be there and there can be leaks , cuts or tears	None known

NASG PROTOCOLS

NASG can be applied for those with:

1. Moderate shock with blood loss > 750ml
2. Pulse rate >100bpm
3. Systolic BP < 100mmhg

Contraindications:

- Viable fetus
- Cardiogenic failure
- Trauma
- Pneumothorax
- Cardiac disease with stenotic valvular diseases

Application of the NASG:

- The person who applies the garment should follow these instructions. The neoprene panels should be stretched with all their strength and they must be fastened with the velcro as tightly as possible.
- If there is breathing difficulty, loosen the abdominal panel slightly but do not remove.

- If the breathing difficulty continues, remove NASG and evaluate the cause of respiratory distress.
- If the cardiorespiratory status was normal, there should be no problem with ventilation.
- If there is no improvement after application, check for proper tightness and give additional saline infusion.
- NASG permits complete perineal access
- If laparotomy is needed, open the abdominal segment with the remaining in situ.

Removal of the NASG:

The NASG can be applied for as long as needed so that patient can be stabilised and the needed hemostasis is achieved. The NASG can be removed when the:

- Hemoglobin> 7 gms
- Hematocrit> 20%
- Pulse rate < 100

The NASG should be removed as follows:

- The lowest segment should be removed first and then the upper segments.

- There should be an interval of 15 minutes between the removal of two segments so that redistribution of blood can be achieved.

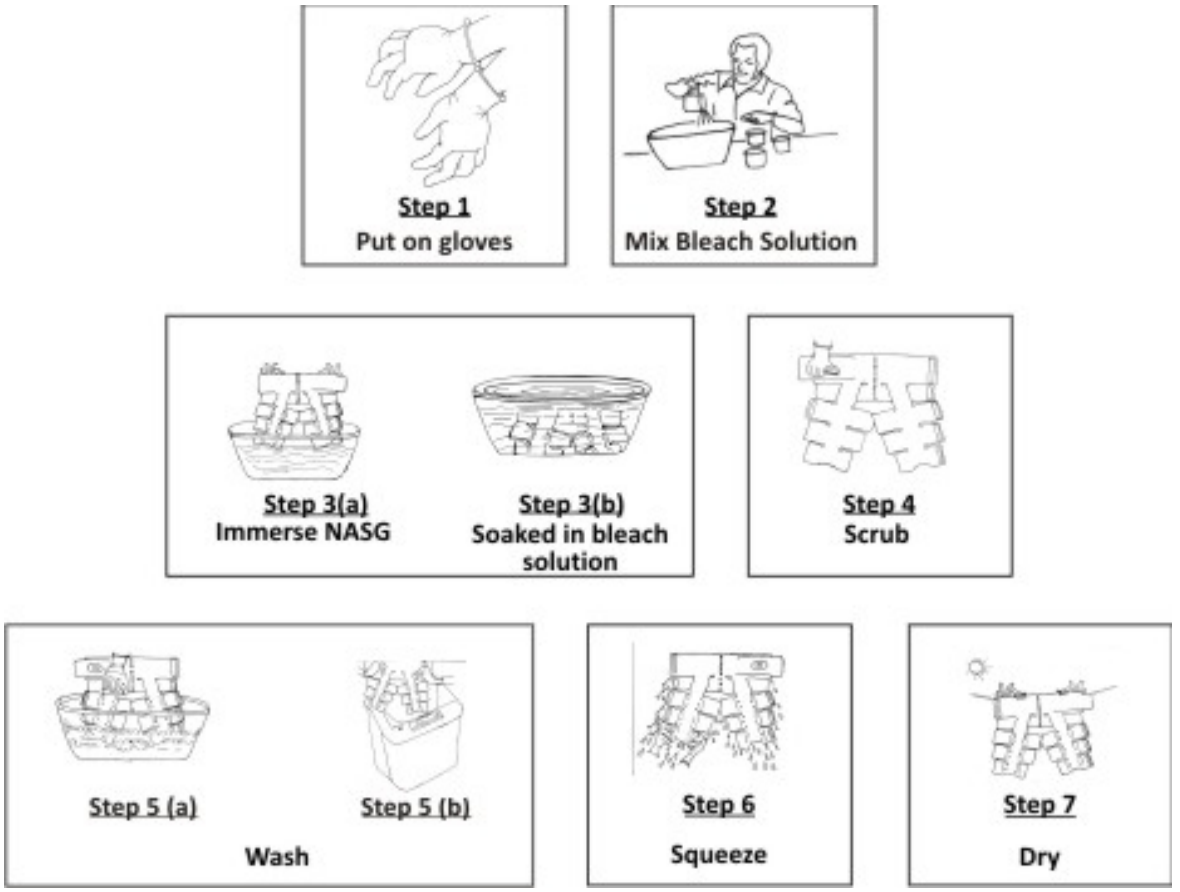
RULE OF 20:

During the NASG removal, if the pulse rate increases by 20 or the blood pressure decreases by 20mmhg after the removal of a segment, it should be replaced and additional fluids or blood must be given. In case the bleeding recurs, the NASG should be replaced and necessary steps must be undertaken.

Avoiding adverse events when using NASG

- One person alone should apply the body segments of NASG
- Urine output should be monitored
- Ensure airway protection and prevent aspiration as required
- Ensure one-on-one nursing care
- Ensure presence of a relative/support person with unconscious patient, ready to explain the garment when patient returns to consciousness

Cleaning the NASG



Storing the NASG:

- Put folded NASG in a clear plastic bag
- Store where the NASG is visible and easily accessible
- Always store at a same place, ensuring everyone knows place of storage.
- Storage locations of all NASGs should be printed and posted in a prominent place

AIM OF THE STUDY

To study the effectiveness of Non Pneumatic Antishock Garment in cases of severe postpartum hemorrhage.

Study Design: Prospective Analytical Study

Period of study: 2011-2012

Place of study: Institute obstetrics &Gynecology, Egmore

Selection of cases:

Women delivering at IOG or referred from outside with severe postpartum hemorrhage.

Inclusion criteria:

Case of PPH with

1. Systolic BP < 100mmHg
2. Pulse Rate > 100/min
3. MAP < 60 mm HG
4. Women requiring transfusion within one hour of delivery
5. Women requiring >1500 ml of IVF within one hour of delivery

Exclusion criteria:

1. Congestive Cardiac failure
2. Cardiac diseases – stenotic valvular diseases
3. Trauma
4. Suspected Pneumothorax
5. Women with viable fetus

ETHICAL CLEARANCE:

Institutional ethical clearance was obtained.

MATERIALS AND METHODOLOGY

This study includes34 women who presented with severe postpartum hemorrhage who were either delivered at or referred to IOG. These women were in a critically ill state and they met the inclusion criteria for application of NASG and they all received appropriate resuscitative measures which includes administration of IVfluids, blood and blood components, oxytocic agents, vaginal procedures and the needed abdominal surgeries .They were applied NASG.Their pre application blood pressure, pulse rate, MAP, urine output, level of consciousness were noted and the vitalparameters were measured every 15 minutes for the first2 hours after application. In case of need for surgeries the women were operated leaving the NASG in situ with the removal of the abdominal segment and there were no difficulties in vaginal procedures.The NASG was removed once the vitals were stable for 2 hours. The same vital parameters were documented at the removal and results were analysed.

Data Analysis:

All collected data were entered in MS Excel sheet & analysis done by proper statistical test using SPSS software, version 16.

RESULTS & ANALYSIS

This study included 34 patients who suffered severe post partum haemorrhage and were either delivered at or referred to IOG . They met the criteria for NASG application. The number of women with Atonic PPH were 25 and traumatic PPH were 9. These patients were given appropriate resuscitative measures including IV fluids, uterotonics, blood transfusion and vaginal procedures or abdominal surgeries as needed. These women were applied NASG. The parameters measured were:

- blood pressure,
- mean arterial pressure,
- pulse rate,
- urine output and
- level of consciousness.

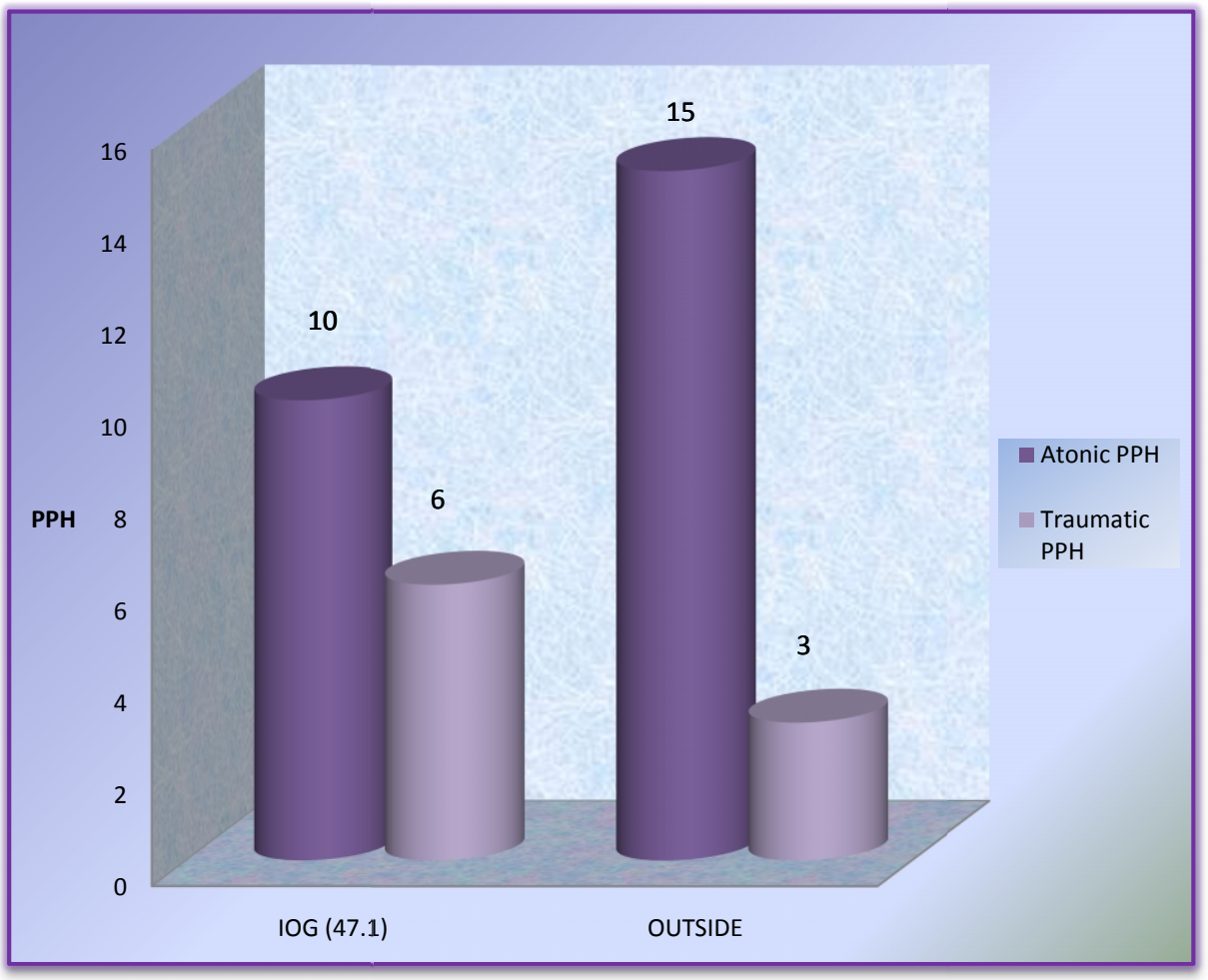
These were measured for every 15 min for the first 2 hours and again at removal of NASG. The NASG was removed once the patient was stable for 2hrs.The efficacy of NASG was analysed using the above mentionedparameters. Of the 34 women who were included in the study, 30 women were resuscitated.

The resuscitation was defined as restoration of mean arterial pressure to ≥ 70 mm HG &improvement in sensorium.Among them four women who presented in very late stage expired inspite of appropriate resuscitative measures.Of the 30 women who were successfully resuscitated, there were statistically significant improvement in blood pressure, level of consciousness, MAP, and decrease in pulse Rate. P value of < 0.05 was considered to be statistically significant .

TABLE - 1

PLACE OF DELIVERY - CROSS TABULATION

Place of Delivery	**Total no:**	**Atonic PPH**	**Traumatic PPH**
IOG	16 (47.1 %)	10	6
Outside	18 (52.9 %)	15	3



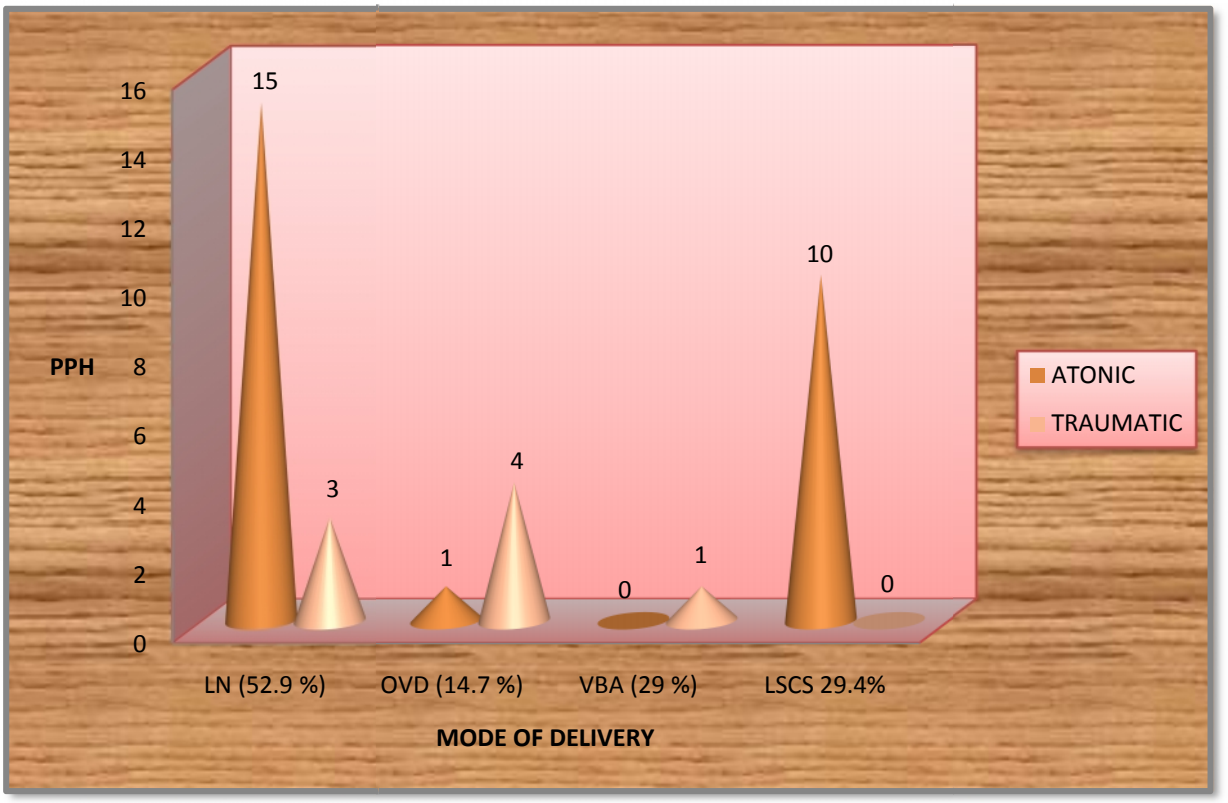
Among them 25 patients suffered from atonic PPH and 9 patients had traumatic PPH and they were managed appropriately.

There were total number of 34 cases with 16 delivered at IOG which constitutes around 47.1% and 18 patients were referred from outside which constitutes around 52.9%.

MODE OF DELIVERY - CROSS TABULATION

MODE OF DELIVERY	PPH		TOTAL	p Value
	ATONIC	TRAUMATIC		
Labour Naturale	15	3	18(52.9 %)	<0.001
Operative vaginal Delivery	1	4	5(14.7 %)	
VBAC	0	1	1(2.9 %)	
LSCS	10	0	10(29.4 %)	

Note: P - Value < 0.001 - Statistically Significant at 1% level



Among the 34 patients, 15 were delivered by labour naturale, 5 patients had operative vaginal delivery and 1 patient had VBAC and 10 were delivered by caesarean section. There was significant correlation between the mode of delivery and the type of PPH . Atonic PPH was more in the labour natural and caesarean groups and traumatic PPH was common in the operative vaginal delivery group.

TABLE - 3

SYSTOLIC BLOOD PRESSURE - PAIRED SAMPLES STATISTICS

		MEAN	**N**	**STANDARD DEVIATION**	**STD ERROR MEAN**
Pair I	SBP - App	77.81	34	10.697	1.891
	SBP - 30M	88.13	34	13.545	2.394
Pair II	SBP - App	77.81	34	10.697	1.891
	SBP - 1H	93.44	34	17.341	3.065
Pair III	SBP - App	78.71	30	9.571	1.719
	SBP - REM	113.55	30	22.143	3.977

This table shows a comparison between the Systolic blood pressure at application, at 30 minutes, 1 hour after application and at removal.

The mean systolic blood pressure at application among the study group was 77.81. At 30 minutes of application, the mean systolic blood pressure

increased to 88.13 and at 1 hour it was 93.44. Among the 30 survivors, the mean systolic blood pressure at removal was 113.55.There is a significant increase in the blood pressure after application of NASG.

TABLE - 4

SYSTOLIC BLOOD PRESSURE - PAIRED SAMPLED TEST

		MEAN	**STANDARD DEVIATION**	**STANDARD ERROR**	**p Value**
Pair I	SBP - App	-0.31	10.313	1.823	< 0.001
	SBP - 30M				
Pair II	SBP - App	-15.63	13.898	2.457	
	SBP - 1H				
Pair III	SBP - App	-34.84	20.635	3.706	
	SBP - REM				

This table shows that the mean value has increased from the time of application to removal and the p-value is < 0.001 which is statistically significant at 1% level.

TABLE 5

GROUP STATISTICS:

	PPH	N	Mean	Std. Deviation	Std. Error Mean
SBP_APP	Atonic	25	77.39	12.142	2.532
	Traumatic	9	78.89	6.009	2.003
SBP_30M	Atonic	25	87.83	15.654	3.264
	Traumatic	9	88.89	6.009	2.003
SBP_1H	Atonic	25	92.17	19.990	4.168
	Traumatic	9	96.67	7.071	2.357
SBP_REM	Atonic	21	112.27	25.991	5.541
	Traumatic	9	116.67	7.071	2.357

This table shows that the improvement in the mean systolic BP was significant in both the traumatic and atonic PPH groups.

The mean systolic BP at application in the atonic PPH group was 77.39. Among the 21 survivors of this group, the mean systolic BP at removal was 112.27. This was statistically significant. Similarly in the traumatic PPH, the mean SBP at application was 78.89 and at removal was 116.67 which was statistically significant.

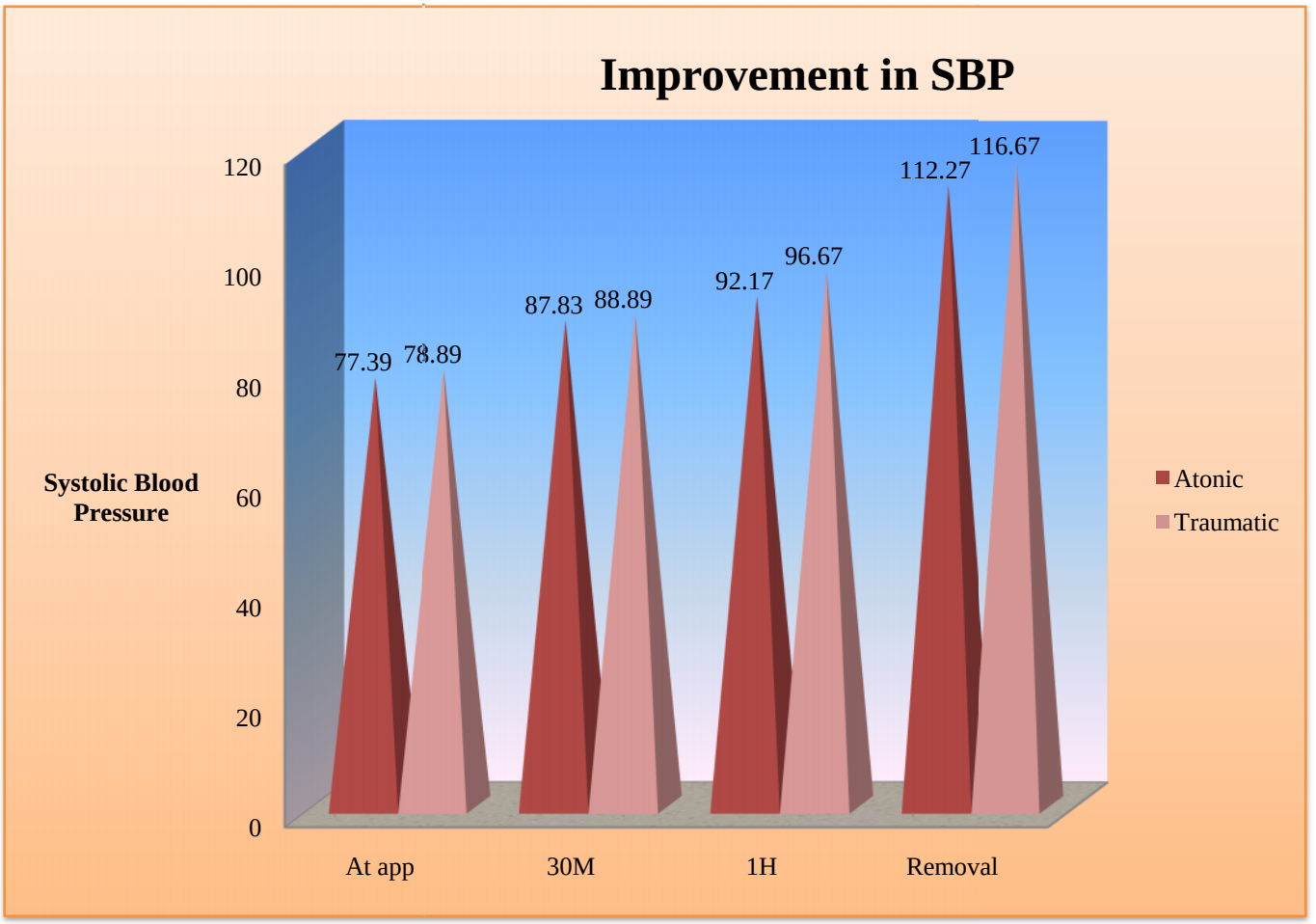

Improvement in SBP
Systolic Blood Pressure
120
100
80
60
40
20
0
77.39
78.89
87.83
88.89
92.17
96.67
112.27
116.67
At app
30M
1H
Removal
Atonic
Traumatic

TABLE - 6

DIASTOLIC BLOOD PRESSURE - PAIRED SAMPLES STATISTICS

		MEAN	N	STANDARD DEVIATION	STD ERROR MEAN
Pair I	DBP - App	51.29	34	8.848	1.589
	DBP - 30M	59.35	34	8.920	1.602
Pair II	DBP - App	51.29	34	8.848	1.589
	DBP - 1H	64.19	34	8.475	1.522
Pair III	DBP - App	51.92	30	8.848	1.589
	DBP - REM	73.87	30	14.532	2.610

This table shows the comparison between the diastolic blood pressure before and after NASG application at 30 minutes, one hour and at removal.The mean diastolic blood pressure at application was 51.29. At 30 minutes of application, it was 59.35 and at 1 hour it was 64.19. Among the 30 survivors, the mean diastolic BP at removal was 73.87. There is a significant increase in the mean diastolic blood pressure from application to removal.

TABLE - 7

DIASTOLIC BLOOD PRESSURE - PAIRED SAMPLES TEST

		MEAN	STANDARD DEVIATION	STANDARD ERROR	p Value
Pair I	DBP - App	– 8.06	6.542	1.175	< 0.001
	DBP - 30M				
Pair II	DBP - App	– 12.90	9.379	1.684	
	DBP - 1H				
Pair III	DBP - App	– 22.58	14.825	2.663	
	DBP - REM				

Note: P - Value < 0.001 - Statistically Significant at 1% level

This table shows a comparison of diastolic blood pressure as three pairs.

The comparison is between the DBP at application, at 30 minutes , at 1 hour and at removal. There is an increase in the DBP with a p-value of < 0.001 which is statistically significant.

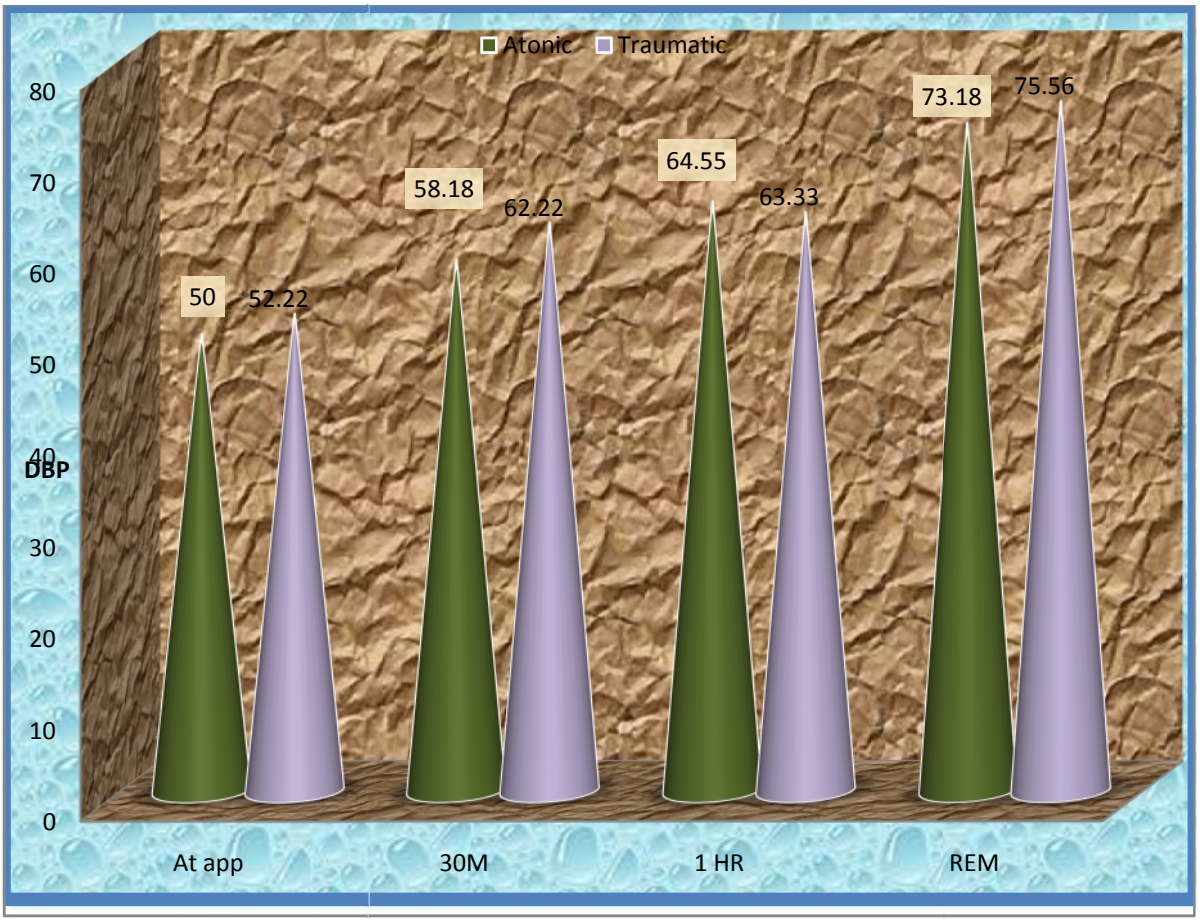
TABLE – 8

GROUP STATISTICS

	PPH	N	Mean	Std. Deviation	Std. Error Mean
DBP_APP	Atonic	25	50.00	10.000	2.085
	Traumatic	9	52.22	8.333	2.778
DBP_30M	Atonic	25	58.18	9.580	2.042
	Traumatic	9	62.22	6.667	2.222
DBP_1H	Atonic	25	64.55	9.625	2.052
	Traumatic	9	63.33	5.000	1.667
DBP_REM	Atonic	21	73.18	17.012	3.627
	Traumatic	9	75.56	5.270	1.757

This table shows the comparison between diastolic blood pressure at various times of application among the atonic and traumatic groups. The mean diastolic BP at application in the atonic PPH group was50.00. Among the 21 survivors of this group, the mean diastolic BP at removal was73.18. This was statistically significant. Similarly in the traumatic PPH, the mean DBP at application was 52.22 and at removal was 75.56 which was statistically significant.

Improvement in diastolic BP*:*



This diagram shows that there was a significant improvement in the mean diastolic blood pressure from application to removal in both atonic and traumatic PPH groups.

TABLE - 9

MEAN ARTERIAL PRESSURE - PAIRED SAMPLES STATISTICS

	MEAN	**N**	**STANDARD DEVIATION**	**STD ERROR MEAN**
MAP - BEFORE	61.010	30	8.3130	1.5177
MAP - AFTER	89.773	30	4.0948	0.7476

This shows that were was a statistically significant improvement in MAP. The Mean arterial pressure has shown a improvement from a pre application mean value of 61.010 to a mean of 89.773 after application.

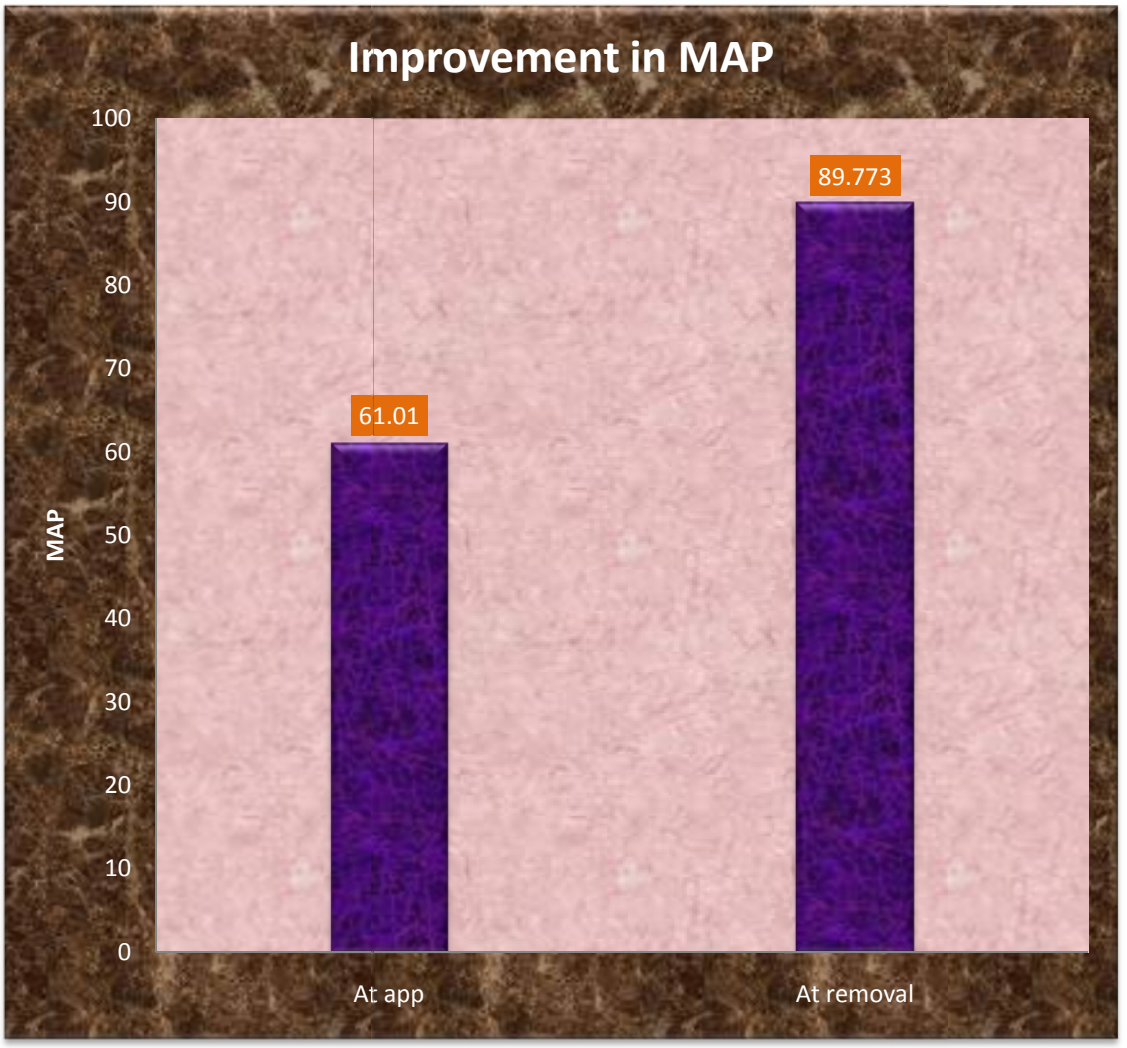
TABLE – 10

MEAN ARTERIAL PRESSURE - PAIRED SAMPLES TESTS

MEAN	**N**	**STANDARD DEVIATION**	**STD ERROR MEAN**
– 28.763	7.1389	1.3034	< 0.001

Note: P - Value < 0.001 statistically significant at 1% level

This shows the paired sample test for improvement in MAP. The p-value was < 0.001 which is statistically significant.



MAP of > 70mmhg is essential for adequate perfusion.The MAP mean before application was 61.01 and after application was 89.773 which shows that NASG application increases the perfusion of vital organs which is statistically significant.

TABLE - 11

PULSERATE - PAIRED SAMPLES STATISTICS

	MEAN	**N**	**STANDARD DEVIATION**	**STD ERROR MEAN**
PULSERATE - BEFORE	128.23	30	11.135	2.033
PULSERATE - AFTER	93.80	30	4.114	0.751

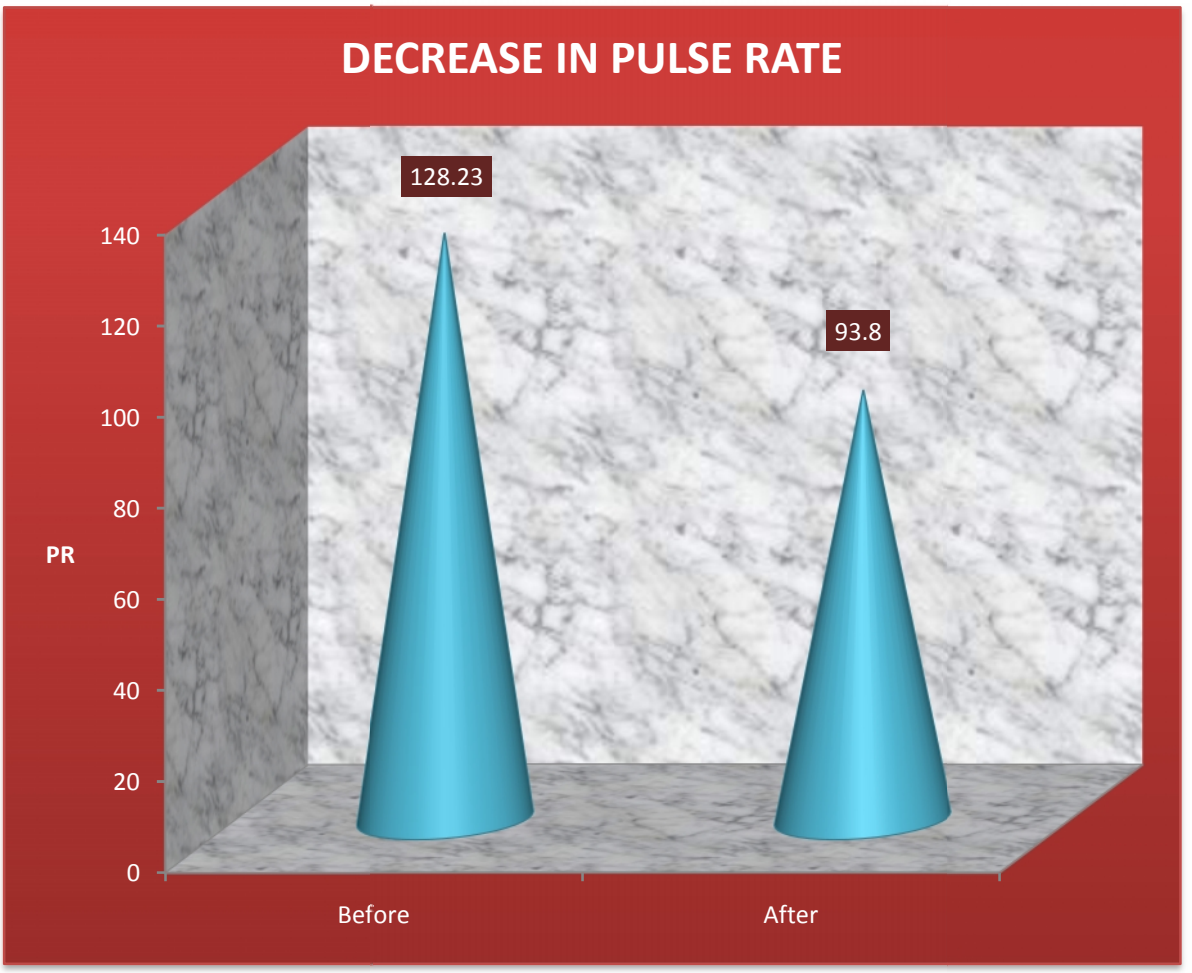
This shows that there is a statistically significant decrease in pulse rate with NASG application from a mean value of 128.23 to a mean value of 93.80 after application.

TABLE - 12

PULSE RATE- PAIRED SAMPLES STATISTICS

MEAN	STANDARD DEVIATION	STD ERROR MEAN	p Value
34.43	10.776	1.967	< 0.001

The p-value for the decrease in pulse rate is <0.001 which is statistically significant.



This shows that the mean pulse rate before application of NASG was 128.23 and after application was 93.8 and there is a statistically significant decrease in pulse rate with a p-value of < 0.001 after NASG application.

TABLE - 13

CROSS TABULATION

LEVEL OF CONSCIOUS	AT APPLY	AT REMOVAL	p Value
Conscious	17 (50.0 %)	30 (88.2 %)	< 0.001
Drowsy	10 (29.4 %)	0	
ON Ventilator	7 (20.6 %)	4(expired) (11.8 %)	

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.486(a)	2	.000
Likelihood Ratio	15.070	2	.001
Linear-by-Linear Association	.248	1	.618
N of Valid Cases	34		

This table gives the details of the level of consciousness of the patients at the time of application and the subsequent improvement with the application of NASG. The table shows that, a total 34 patients were applied NASG. Among them,

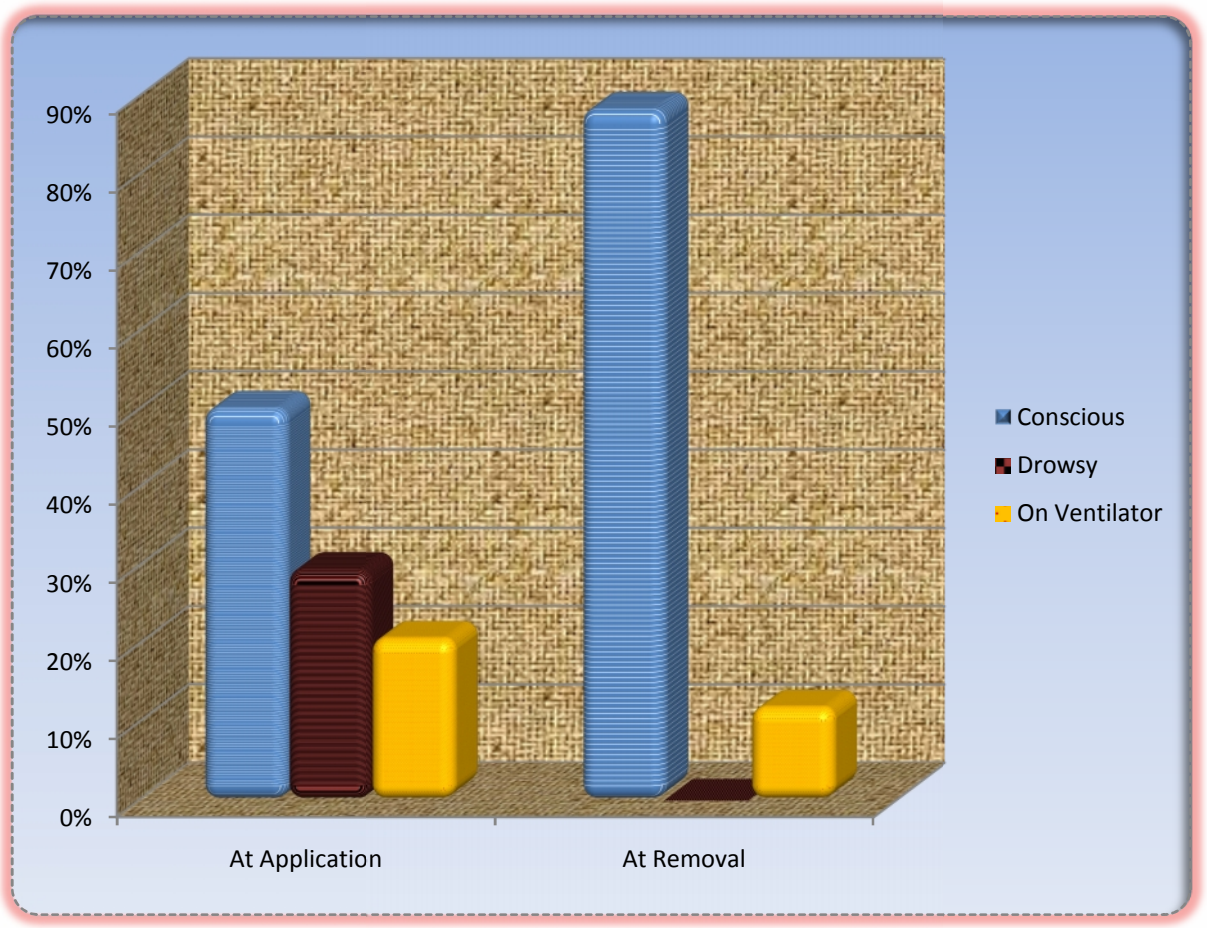
- 17 were conscious at the time of application of NASG
- 10 were drowsy at the time of application
- 7 patients were on ventilator at the time of application .

At the time of removal of NASG, the findings are:

- 17 patients who were conscious remained conscious and 10 patients who were drowsy showed an improvement in their sensorium and became conscious at the time of removal of NASG.
- Among the 7 who were on ventilator support, three patients regained consciousness and 4 of them were in a moribund state and could not be revived inspite of all the measures.

This shows that there is a significant improvement in level of consciousness with NASG application with a statistically significant p-value of < 0.001.

LEVEL OF CONSCIOUSNESS



This shows that there is a significant improvement in level of consciousness with NASG application. 50% were conscious, 29.4% were drowsy and 20.6% were on ventilator on application. At removal 88.2% were conscious , 0% were drowsy and 11.8% expired. The p-value is < 0.001 which is statistically significant.

DISCUSSION

- This prospective study was conducted at IOG during the period 2011-2012.
- The purpose of this study is to study the effectiveness of Non pneumatic antishock garment in cases of severe postpartum hemorrhage.
- In our study, we had 34 women of severe postpartum hemorrhagewho were referred to IOG or delivered at IOG and was in a critically ill state and they met the inclusion criteria for NASG which includes:
    - ♣ Systolic blood pressure < 100mmhg
    - ♣ Pulse rate > 100mmhg
    - ♣ Mean arterial pressure < 60mmhg
    - ♣ Requirement of IV fluids > 1500ml or blood within one hour of delivery.

These women were classified according to the type of Post partum Hemorrhageas atonic and traumatic PPH and were treated appropriately. All of the women received appropriate resuscitative measures including IV Fluids, uterotonics, blood transfusion, and vaginal procedures or abdominal surgeries as needed. These women were monitored using the following parameters.

- Mean arterial pressure
- Blood pressure
- Pulse rate
- Urine output & level of consciousness

These parameters were measured at application ,then every 15 min for first 2 hours then at removal. The criteria for removal was that the vital parameter should be stable for atleast two hours. During removal the lower segment was removed first then proceeding upwards. In case if there is a fall in Blood Pressure by 20mmhg or if the pulse rate increases by 20 beats per minute , the removed segment was reapplied and fluids administered. The efficacy of NASG was measured comparing the improvement in the vital parameters before and after the application. The study results were as follows.

- Place of delivery does not influence the outcome and we had 16 cases who delivered in IOG and 18 cases who were referred from outside .Some of the patients who were referred were transported with the NASG.
- Mode of delivery has an impact on the types of PPH and it was statistically significant.There were more number of atonic PPH in the labour natural and LSCS group and the incidence of traumatic PPH

was higher in the operative delivery group which was statistically significant.

- The blood pressure improvement after NASG was statistically significant.The blood pressures were measured as systolic, diastolic and the Mean Arterial Pressure. There was a significant improvement in blood pressure within minutes of application and the values are as follows:

SYSTOLIC BLOOD PRESSURE: MEAN VALUES

The improvement in the mean systolic BP was significant in both the traumatic and atonic PPH groups. The mean systolic BP at application in the atonic PPH group was 77.39. Among the 21 survivors of this group, the mean systolic BP at removal was 112.27. This was statistically significant. Similarly in the traumatic PPH, the mean SBP at application was 78.89 and at removal was 116.67 which was statistically significant.

DIASTOLIC BLOOD PRESSURE: MEAN VALUES

The comparison between diastolic blood pressure at various times of application among the atonic and traumatic groups was noted. The mean diastolic BP at application in the atonic PPH group was 50.00. Among the 21 survivors of this group, the mean diastolic BP at removal was 73.18. This was statistically significant. Similarly in the traumatic PPH, the mean DBP at

application was 52.22 and at removal was 75.56 which was statistically significant.

MEAN ARTERIAL PRESSURE- MEAN VALUES

- ♣ Before application – 61.010
- ♣ After application (at removal) – 89.773

This improvement in blood pressure was statistically significant with a p-value of <0.001

Elsayed et[26] al reported a case report of 18 year old woman with PPH which was refractory to the usual measures at the Lucile Packard children's Hospital, Stanford university , California, USA. The patient continued to bleed inspite of all resuscitative measures. The surgeons finally Packed the uterus and thenapplied the NASG. Within minutes of NASG placement,the patient had a remarkable improvement in the sensorium,and the bleeding subsided, pulse rate decreased and the blood pressure increased. The NASG was removed once the patient became stable and she was discharged.

Brees et al,[1,2] reported on case series of 14 consecutive cases of obstetric haemorrhage in Sialkot; obstetric aetiologies & conditions upon NASG placement were similar to the other studies. Out of the fourteen cases,thirteen cases were resuscitated immediately after NASG placement; they were then given standard hemorrhage treatment protocol and they wereall stabilized. Of

the 14 one women expired and she died on post op day19 and she was in a bad condition with multi organ failure and severe anemia before NASG application and she could not be revived. Neither Hensleigh nor Brees reported adverse effects.

Hensleigh[1] described six women with obstetric Haemorrhage, in moderate to severe shock. All patients were managed with a protocol of immediate NASG application, fluid replacement, blood transfusion, uterotonics& procedures / operations as needed. All women experienced rapid resuscitation & remained stable while awaiting definite treatment.

PULSE RATE

There was a statistically significant decrease in pulse rate in our study from a mean of 128.23 to 93.80 and the p-value was <0.001.

LEVEL OF CONSCIOUSNESS

In this study, out of the 34 patients who were included, the level of consciousness are as follows:

- Conscious- 17 were conscious at the time of application and at the time of removal 30 were conscious
- Drowsy – 10 were drowsy at the time of application and they had remarkable improvement in their sensorium within minutes of application of NASG

– On Ventilator

Seven women were on ventilatory support at the time of application and 3 regained consciousness during removal. The remaining 4 were in severe shock during application and they could not be revived.

There was a statistically significant improvement in the level of consciousness with a p-value of <0.001.

Similar reports were given by Hensleigh[12] et al &Breeset al[25].

There was also improvement in urine output after NASG application which indicate that NASG improves the perfusion of vital organs by increasing the perfusion pressure.

Mourad – youssif et al[26]conducted a study in four of the referral facilities in Nigeria and in Egypt. The women who had uterine atony, retained placenta, adherent placenta, uterine rupture and extensive genital tract lacerations were included in the study and they were applied NASG in addition to appropriate resuscitative measures. He showed decrease in mortality from 9% are intervention to 3.1% in the NASG phase and there was significant decrease in severe morbidity and blood loss.

SUMMARY

- In summary the study results are as follows:
- The sample size was 34 women with severe post partum haemorrhage.
- Of these 25 had atonic PPH and 9 had traumatic PPH
- There was statistically significant increase in the blood pressure before and after application. The mean value of MAP is 61.010 before application and 89.773 after application with a p-value of <0.001
- The pulse rate decreased significantly from a mean of 128.23 before application to 93.80 after application. The p-value was < 0.001
- There was a significant improvement in the level of consciousness.

CONCLUSION

This study included 34 patients of severe postpartum haemorrhage of which 25 had atonic PPH and 9 had traumatic haemorrhage. These patients were given appropriate resuscitative measures and applied NASG. The efficacy of NASG was evaluated and using the improvement in vital parameters like MAP, BP decrease in pulse rate, and improvement in sensorium. This study showed a statistically significant improvement in MAP, Blood pressure and sensorium and decrease in pulse rate. However further studies using larger sample size are required to support the results obtained.

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PROFORMA

NAME:

AGE:

IPNO:

UNIT:

ADDRESS FOR COMMUNICATION:

OBSTETRIC SCORE:

PLACE OF DELIVERY:

MODE OF DELIVERY AND BABY DETAILS:

PPH-ATONIC/ TRAUMATIC:

GENERAL EXAMINATION:

VITALS:

PER ABDOMEN EXAMINATION:

LOCAL EXAMINATION:

URINE OUTPUT

NASG APPLICATION DETAILS:

TIME OF APPLICATION	PULSE RATE	BP	URINE OUTPUT	TYPE OF INTERVENTION

REMOVAL OF NASG

PATEINT OUTCOME

ABBREVIATIONS:

NASG- Non Pneumatic Antishock Garment

WHO - World Health Organisation

PPH - Post Partum Hemorrhage

ROM - Rupture of membranes

FIGO- International Federation of Obstetrics and Gynecology

ICM - International Confederation of Midwives

RI - Resistance Index

PHC - Primary Health Centre

ITP - Idiopathic Thrombocytopenic Purpura

MAP - Mean Arterial Pressure

CVP - Central Venous Pressure

HR - Heart Rate

SBP - Systolic blood pressure

DBP - Diastolic blood pressure

PASG - Pneumatic antishock garment

LOC - Level Of Consciousness

KEY TO MASTER CHART:

DNI – Delivery NASG interval

DN - Duration of NASG

LOC - Level of consciousness

MAP – Mean arterial pressure

UO – Urine output

PR - Pulse rate

C – conscious

D – drowsy

V – on ventilator

B – booked

UB – unbooked

V.EX-Vaginal Exploration

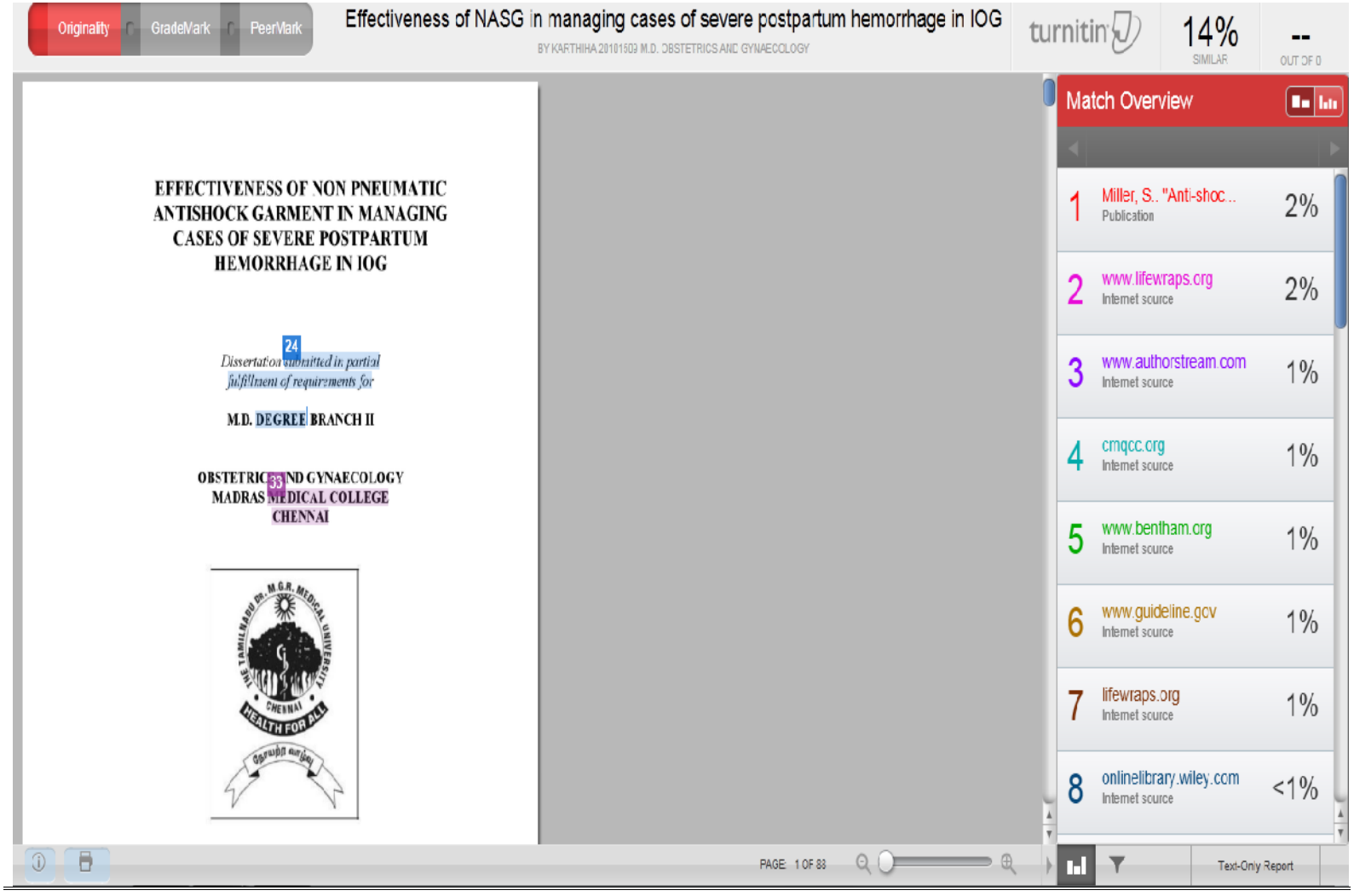
HYS- Hysterectomy

MRP-Manual Removal of Placenta

NAME	AGE	PLACE OF DELIVERY	OBSTETRIC SCORE	MODE OF DELIVERY	BABY DETAILS	BOOKING STATUS	PPH -	RISK FACTORS	DNI	DN	BP-SYSTOLIC				BP-DIASTOLIC				MAP		PR/MIN		UO(ML/HR)	LOC		GENERAL PROTOCOL	SURGICAL INTERVENTION	OUTCOME
				LN							AT APPL	30MIN	1HR	AT REMOVAL	AT APPL	30MIN	1HR	REMOVAL	BF	AF	AT APPL	AT REMOVAL		AT APPL				RESUSCITATED
DEEPA	23	out	P3L3	LN	3.5 KG ALIVE	UB	A	ANEMIA	3	10	70	80	80	120	50	50	60	70	56.7	87	122	98	100	C	C	YES		YES
BRINDHA	21	out	P1L1	LSCS	3.2 KG ALIVE	B	A	PIH	6	16	70	100	100	120	50	60	70	80	56.7	93	100	82	100	V	C	YES		YES
KAVITHA	24	IOG	P1L1	LN	3.2 KG ALIVE	B	T	NIL	1.5	8	80	100	100	110	60	60	60	70	66.7	83	120	96	75	C	C	YES	V.EX	YES
SUMITHRA	22	out	P3L3	LN	3.1 KG ALIVE	UB	A	NIL	4	20	50	90	100	100	20	40	60	70	30	80	120	96	75	C	C	YES		YES
PRIYA	26	IOG	P2L2	LN	3.6 KG ALIVE	B	A	ANEMIA	1	12	80	90	100	120	60	70	70	80	66.7	93	128	92	75	D	C	YES		YES
BHUVANESWARI	25	out	P2L2	LN-VBAC	2.4 KG ALIVE	B	T	RUPTURE UTERUS	6	18	80	90	100	120	40	60	60	80	53.3	93	134	92	75	D	C	YES	HYS	YES
GAYATHRI	27	IOG	P1L1	FORCEPS	3.4 KG ALIVE	B	T	NIL	1.5	10	80	90	110	120	60	70	70	80	66.7	93	126	90	100	C	C	YES		YES
VAIDEGI	26	out	P3L3	LN	2.4 KG	UB	A	NIL	5	24	90	100	110	120	60	70	70	80	70	93	142	92	100	D	C	YES		YES
MANONMANI	21	IOG	P1L1	LN	2.3 KG ALIVE	B	A	NIL	1	14	80	90	110	110	40	50	70	80	53.3	83	128	86	100	C	C	YES		YES
UMA	27	out	P2L2	LSCS	3.1 KG ALIVE	B	A	PREV LSCS	5	12	90	100	110	120	60	70	70	80	70	97	132	88	75	C	C	YES		YES

SELVI	26	out	P2L2	FORCEPS	2.5 KG ALIVE	UB	T	PIH	4	24	70	80	90	120	50	60	60	80	56.7	93	120	92	75	C	C	YES	V.EX	YES
FATHIMA	24	out	P2L2	LSCS	2.8 KG ALIVE	B	A	PREV LSCS	4	20	90	100	1OO	130	60	60	60	70	70	90	110	92	100	C	C	YES		YES
SARADHA DEVI	30	out	P4L4	LN	2.3 KG ALIVE	UB	A	MULTIPARITY/ RETAINED PLACENTA	6	26	70	80	80	110	50	50	50	80	56.7	90	162	96	100	V	C	YES		YES
KANAGA	21	IOG	P1L1	LN	2.2 5KG ALIVE	B	A	PIH	1	8	90	100	100	130	50	60	60	80	63.3	97	120	92	100	C	C	YES		YES
GLORY ARULTHANGAM	29	IOG	P2L2	LN	3.2 5KG ALIVE	B	T	NIL	2	12	80	90	90	110	40	60	60	80	53.3	90	122	92	100	C	C	YES	V.EX	YES
NITHYA	26	out	P3L3	LN	3.2 5KG ALIVE	UB	A	MULTIPARITY	6	4	0	0	0	0	0	0	0	0	0	0	NR	NR	0	V	V	YES		DEAD
SUBBULAKSHMI	25	out	P2L2	VBAC	2.3 KG DEAD	B	T	RUPTURE UTERUS	4	24	70	80	90	110	50	50	60	70	56.7	83	142	98	50	D	C	YES	HYS	YES
DHANALAKSHMI	26	IOG	P1L3	LSCS	ALIVE	B	A	TRIPLETS	2	10	90	100	110	120	60	60	70	80	70	90	128	96	100	C	C	YES		YES
BHUVANESWARI	24	IOG	P2L2	LN	2KG ALIVE	B	A	JAUNDICE	1	6	70	60	40	0	40	30	30	0	43.3	0	142	NR	NIL	V	V	YES		DEAD
BHUVANA	22	IOG	P1L1	LSCS	3KG ALIVE	B	A	NIL	1	12	80	90	90	120	50	60	70	70	60	87	134	92	100	D	C	YES	HYS	YES
MANJULA	32	IOG	P1L1	LN	3.6 KG ALIVE	B	T	NIL	1.5	16	90	90	100	130	60	70	70	70	70	90	126	92	100	C	C	YES	V.EX	YES
RADHADEVI	30	out	P1L1	LSCS	3KG ALIVE	B	A	NIL	6	2	0	0	0	0	0	0	0	0	0	0	0	NR	0	V	V	YES		DEAD
BHAVANI	30	IOG	P2L2	LN	3.8 KG ALIVE	B	A	NIL	1.5	12	90	100	100	120	50	60	60	80	63.3	93	132	98	100	D	C	YES		YES

POONGODI	22	IOG	P1L2	LSCS	ALIVE	B	A	TWINS	2	8	80	90	100	120	60	60	70	80	66.7	93	128	96	100	C	C	YES		YES
SARANYA	27	IOG	P1L1	LN	2.8 KG ALIVE	B	A	NIL	1	16	70	80	90	110	50	60	70	80	56.7	90	122	98	100	C	C	YES		YES
LAKSHMI	26	out	P2L2	LN	3.5 KG ALIVE	B	A	RETAINED PLACENTA	5	24	70	90	90	110	50	60	70	80	56.7	90	124	98	NIL	V	C	YES	MRP	YES
RANI	27	out	P1L1	LSCS	3KG ALIVE	B	A	NIL	5	24	50	30	30	0	30	0	0	0	16.6	0	NR	NR	NIL	V	V	YES	HYS	DEAD
MAHALAKSHMI	26	IOG	P1L2	LSCS	ALIVE	B	A	ABRUPTION	2	20	90	90	100	120	60	70	70	80	70	93	142	88	75	D	C	YES		YES
SABANABEGUM	27	out	P4L4	LN	3.3 KG ALIVE	UB	A	MULTIPARITY	6	24	70	90	100	110	50	60	70	80	56.7	90	132	98	75	D	C	YES	HYS	YES
ARPUTHAM	32	out	P1L1	LSCS	3.5 KG ALIVE	B	A	OBSTRUCTED LABOUR	4	20	80	90	90	120	50	60	70	70	60	87	142	96	100	D	C	YES		YES
SHANTHI	35	out	P3L3	LN	3.2 KG ALIVE	UB	A	MULTIPARITY	4	24	90	90	100	120	50	60	70	70	63.3	87	132	98	100	D	C	YES	HYS	YES
NIRUPA	28	IOG	P1L1	FORCEPS	3.4 KG ALIVE	B	T	NIL	2	10	80	90	100	110	60	70	70	80	66.7	90	124	96	100	C	C	YES	V.EX	YES
GAYATHRI	29	out	P2L2	LN	3.2 KG ALIVE	B	A	PIH	4	12	70	90	90	120	50	60	60	70	56.7	87	128	98	100	C	C	YES		YES
DEEPA	23	IOG	P1L1	FORCEPS	3KG ALIVE	B	T	NIL	1	14	80	90	90	120	50	60	60	70	66.7	87	125	96	100	C	C	YES	V.EX	YES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EFFECTIVENESS OF NON PNEUMATIC ANTISHOCK GARMENT IN MANAGING CASES OF SEVERE POSTPARTUM HEMORRHAGE IN IOG
Dissertation submitted in partial fulfillment of requirements for
M.D. DEGREE BRANCH II
OBSTETRICS AND GYNAECOLOGY
MADRAS MEDICAL COLLEGE
CHENNAI
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